EAST BRANCH OF THE SOUTH BRANCH KISHWAUKEE RIVER (INCLUDING THE UNION DITCH AND VIRGIL DITCH SYSTEMS) WATERSHED-BASED PLAN

THE PURPOSE OF THE EAST BRANCH OF THE SOUTH BRANCH KISHWAUKEE RIVER (INCLUDING THE UNION DITCH AND VIRGIL DITCH SYSTEMS) WATERSHED-BASED PLAN IS TO PROVIDE STAKEHOLDERS A BETTER UNDERSTANDING OF THE WATERSHED AND TO PROMOTE THE IMPLEMENTATION OF PLAN RECOMMENDATIONS AIMED AT THE PROTECTION AND IMPROVEMENT OF WATER QUALITY, THE PRESERVATION AND RESTORATION OF NATURAL AREAS, AND THE REDUCTION OF FLOOD DAMAGES IN THE WATERSHED.

Prepare by:

Hey and Associates, Inc.

THIS PROJECT IS FUNDED, IN PART, BY A GRANT FROM THE DEKALB COUNTY COMMUNITY FOUNDATION.

FUNDING FOR THE DEVELOPMENT OF THE EAST BRANCH OF THE SOUTH BRANCH KISHWAUKEE RIVER WATERSHED-BASED PLAN WAS PROVIDED IN PART THROUGH THE USEPA SECTION 319(H) OF THE CLEAN WATER ACT DISTRIBUTED THROUGH THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY. THE FINDING AND RECOMMENDATIONS HEREIN ARE NOT NECESSARILY THOSE OF THE FUNDING AGENCIES.

FOREWORD

The East Branch of the South Branch Kishwaukee River (including the Virgil and Union Ditches) Watershed Plan (Watershed Plan) is a product and a process composed of input from many individuals and organizations. The Watershed Plan is designed to create a collective impact on the water quality, the management of stormwater and the overall quality of life of those who live and work within or who are otherwise affected by this watershed.

Why a watershed planning focus in DeKalb and Kane Counties?

To understand the significance of watershed planning that includes sections of two counties-- an eastern section of DeKalb County and a western section of Kane County--it is helpful to understand how evolving interests and resources from a variety of sectors and perspectives coalesced into a watershed planning process.

Beginning in 2006 – the DeKalb County Community Foundation (DCCF) made a commitment to increase efforts in enhancing the quality of life in DeKalb County by developing its proactive CommunityWorks initiatives which includes the focus of land use along with early care and education and workforce development. Working with generous local donors, DCCF created 20 endowment funds that together annually generate more than $60,000 in grants that are administered with oversight of a countywide steering committee.

During the next few years, the DCCF CommunityWorks Land Use Committee gathered extensive stakeholder input from municipalities, the DeKalb County Regional Planning Commission, and residents and decided to focus its efforts with the goal of "providing tools for key DeKalb County decision-makers so that future land use decisions are informed, wise and serve the common good". Further discussions with municipalities helped DCCF to realize that water issues – stormwater management in particular, were issues that municipalities struggle with on a regular basis. As a result, DCCF issued three mini-grants to Genoa, Kingston and Maple Park to upgrade their stormwater ordinances. While working with these municipalities, DCCF and the municipalities learned in the process that they were limited in what they could do to manage stormwater, unless issues were addressed on a broader watershed level, since water doesn't limit itself to jurisdictional boundaries.

About this same time the DeKalb County Stormwater Management Planning Committee (DCSMPC) was exploring its own options for managing stormwater within the county. Formed in 2005, the DCSMPC identified flooding and problems with stormwater as common and important concerns facing all communities and many farmers and residents in the rural areas of DeKalb County. As a result, the DCSMPC decided to take a watershed-based approach to stormwater assessment and planning, quickly recognizing that by addressing water quality issues, stormwater is also addressed. Recognizing the opportunities inherent in their unique and shared interests, the DCSMPC has been working together with the DCCF since 2009 to identify opportunities to address water quality, flooding and stormwater management issues throughout the county.

The watershed area studied through the EPA Watershed Planning grant was identified by the DCSMPC as a priority area within DeKalb County in need of a watershed plan. Given that a significant portion of the priority watershed extended into Kane County, both the DCSMPC and the

DCCF Land Use Steering Committee recognized the need to establish a process that included the creation of a Watershed Planning Steering Committee that would be comprised of individuals or organizations representative of both counties.

In December 2012, working together through the newly formed "Union Ditch/Virgil Ditch & East Branch Kishwaukee River Watershed Planning Steering Committee" (Watershed Planning Steering Committee), DCCF and DeKalb County government secured $58,000 of Section 319(h) funding through the Illinois Environmental Protection Agency based upon a $30,000 cash match from DCCF, plus in-kind support from entities in both Kane and DeKalb County and the DCCF.

Next Steps

The organizations that have been partners of the Union Ditch/Virgil Ditch & East Branch Kishwaukee River Watershed Planning Steering Committee have made a commitment to consider and implement to the extent possible, the prioritized recommendations that have evolved out of the watershed planning process. For example, the DCCF Land Use Committee will look to the prioritized recommendations of the Watershed Plan in considering its Land Use grantmaking decisions. Partners developed through this watershed planning process will prioritize project recommendations for collaborative grant seeking opportunities going forward.

The Watershed Plan is intended to provide watershed stakeholders – virtually anyone living in the watershed – with a framework and the direction needed to improve and/or protect critical areas and minimize the negative impacts of human activities to the critical green infrastructure that has been assessed and is alive and well within this studied section of the Kishwaukee River and its tributaries.

As development or the conversion of land to urban /suburban uses occurs, it is critical that stakeholders in the watershed take appropriate action to recognize, appreciate and protect our natural resources. This Watershed Plan is an advisory document designed for that purpose; to be used by all who live and work in this watershed, including residents, private landowners, municipal and county officials and their staff, developers, and not-for-profit land stewardship organizations.

ACKNOWLEDGEMENTS

The Union Ditch/Virgil Ditches & East Branch Kishwaukee River Watershed Based Planning Project was made possible by a grant from the Clean Water Act Section 319(h) Assistance and the Illinois Environmental Protection Agency, Bureau of Water and the DeKalb County Community Foundation distributed to the County of DeKalb through the Planning, Zoning and Building Department.

Considerable time and energy and in kind support was provided by the Union Ditch/Virgil Ditch & East Branch Kishwaukee River Watershed Planning Steering Committee (Watershed Planning Steering Committee) which provided oversight of the planning process for this project, comprised of the following members, Brian Gregory, Sycamore City Administrator; Dean Johnson, DeKalb County Soil & Water Conservation District; Jeremy Lin, Engineer, Maple Park; Karen Miller, Kane County Development Department; Paul Miller, DeKalb County Stormwater Management Planning Committee; Donna Prain, Stormwater Management Planning Committee; Nathan Schwartz, DeKalb County Engineer; Roger Steimel, Stormwater Management Planning Committee/Cortland-Pierce Drainage District; and Anita Zurbrugg, Program Director, DeKalb County Community Foundation. This Committee benefited greatly from the dedicated, professional and effective leadership of Chair, Dean Johnson.

Special acknowledgement goes to students of Northern Illinois University from the departments of Biology, Geology, and Environmental Studies,under the direction of Carl von Ende, Department of Biological Sciences; Melissa Lenczewski and Sheldon Turner, Department of Geology and Environmental Geosciences Department of Geology, Environmental Science Consortium. Working with them were students of Sycamore High School under the instruction of Scott Horlock, Biology Teacher, Sycamore High School. Together, these students and instructors coordinated and collected data and provided research for portions of the studied watershed. The rewards for student involvement were extensive, as stated by Scott Horlock:

> *The opportunities for our students have been incredible. They have not only learned about the environment in their back yard while working alongside of Professors from NIU but they have developed a sense of civic responsibility and started to build relationships with members of county government and other agencies. The students who attended the informational meeting on the watershed were beaming with pride when they saw and heard the information that Deanna [Doohaluk] presented and they helped to collect. On top of all of this, the 4 students primarily involved in this project have received numerous college scholarships in part because of the experiences they have had with the watershed project.*

Significant appreciation is attributed to presenters at community outreach workshops and events held throughout the course of the 18-month watershed planning process, including: Dewey Barnes, Ideal Industries, Fred Busse, Public Works Director, City of Sycamore; Brent Denzin, Partner, Attorney at Law, Ancel Glink, Diamond, Bush, DiCianni & Krafthefer, Chicago; Deanna Doohaluk, Water Resource Planner, Vince Mosca and Jeff Wickenkamp, Hey and Associates, Inc.; Dan Gibble, Executive Director, Sycamore Park District; Dean Johnson, Resource Conservationist, DeKalb County Soil & Water Conservation District; Michael Konen, Soil Scientist, Associate Professor, Geography Department, Northern Illinois University; Paul Miller, Director, DeKalb County Planning, Zoning and Building Department, Donna Prain, High School Biology Teacher; Michael Richolson, District Conservation, USDA NRCS; Al Roloff and Terry Hannon, DeKalb

County Forest Preserve, Amy Burns Walkenbach, Manager, Watershed Management Section, Illinois EPA; Anita Zurbrugg, Program Director, DeKalb County Community Foundation.

The many contributors to the planning process and through in-kind and/or technical support include: City of Sycamore; DeKalb County Farm Bureau; DeKalb County Community Foundation Land Use Committee; DeKalb County Forest Preserve District; DeKalb County Highway Department; DeKalb County Health Department; DeKalb County Stormwater Management Planning Committee; DeKalb County Economic Development Corporation; DeKalb County Soil and Water Conservation District; Kane/DuPage Soil and Water Conservation District; Kane County Farm Bureau; Kane County Development and Community Services Department; Kane County Forest Preserve, Kishwaukee River Ecosystem Partnership; Sycamore Park District; Town of Cortland; Village of Maple Park; and the Cortland-Pierce, Virgil-Cortland, Coon Creek, Virgil #1 & #3, Union #3 Drainage Districts.

Special thanks is noted for the thorough and professional work of Project Consultant, Deanna Doohaluk, Water Resource Planner, Hey and Associates, Inc.

And finally, the project would not have been possible without the capable and inspiring leadership and guidance of Paul Miller, Director, and Rebecca Von Drasek of the DeKalb County Planning, Zoning and Building Department.

Union Ditch/Virgil Ditch Watershed Steering Committee
June, 2014

Executive Summary

The East Branch South Branch Kishwaukee River

The East Branch South Branch Kishwaukee River watershed is located in east-central DeKalb County and southwestern Kane County (Figure 1). The East Branch South Branch Kishwaukee River is a major tributary to the South Branch Kishwaukee River in DeKalb County, with the confluence about one mile west of Shabbona. The watershed drains approximately 123 square miles of land into the South Branch Kishwaukee River (Figure 2). The South Branch Kishwaukee River continues to flow west to its confluence with the Kishwaukee River. From this confluence, the Kishwaukee River flows westward through Rockford before joining the Rock River. The Rock River flows to the southwest before joining the Mississippi River in the Quad Cities area (Moline, Illinois; Rock Island, Illinois, Davenport, Iowa; and Bettendorf, Iowa).

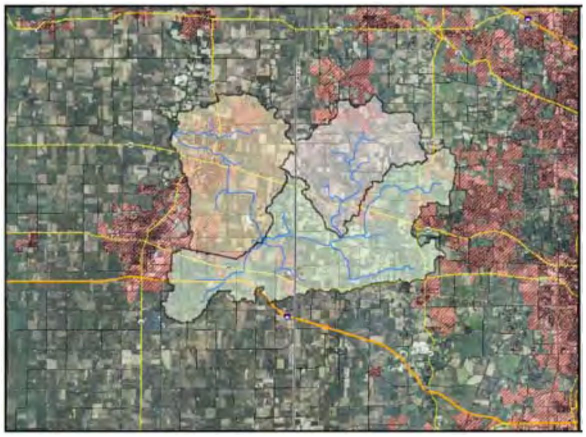


Figure 1: General Watershed Location

The East Branch South Branch Kishwaukee River Watershed can be divided into 3 primary subwatersheds: Virgil Ditch, Union Ditch, and the East Branch South Branch Kishwaukee River (Figure 3-2). The Virgil Ditch subwatershed finds its headwaters in northwestern Kane County and flows south into Union Ditch. The Union Ditch system generally flows west from Kane County into DeKalb County and flows into the East Branch South Branch Kishwaukee River. As noted above, the East Branch South Branch Kishwaukee River is a major tributary to the South Branch Kishwaukee River.

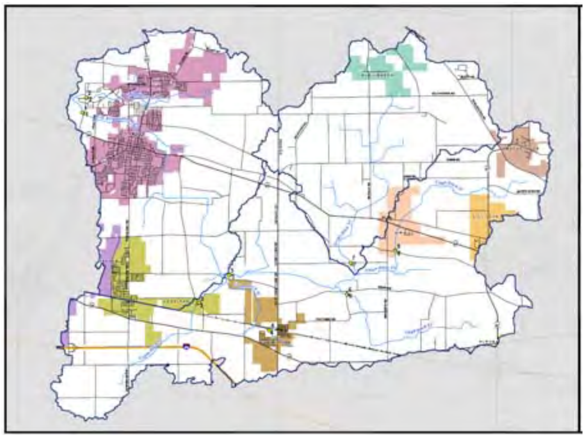


Figure 2: Watershed Map

Collectively, there are 72.7 stream miles in the East Branch South Branch Kishwaukee River Watershed: 21.3 miles attributed to East Branch South Branch Kishwaukee River, 13.7 miles of Virgil Ditch and 37.7 miles of Union Ditch. Available data indicates that 2,475 acres of wetlands are located within the East Branch South Branch Kishwaukee River watershed. There is one major surface impoundment in the watershed: Sycamore Lake. Sycamore Lake is 7.5 acres in size and is located within the East Branch South Branch Kishwaukee River subwatershed.

Two counties, eight municipalities and eleven townships comprise the East Branch South Branch Kishwaukee River watershed. Approximately 49.1% of the watershed is in DeKalb County and the remaining 50.9% in Kane County. Approximately 17.07% is incorporated in one of the eight municipalities: Village of Burlington, Village of Cortland, City of DeKalb Village of Elburn, Village of Lily Lake, Village of Maple Park, City of Sycamore, and Town of Virgil. The East Branch South

Branch Kishwaukee River Watershed is approximately 84.34% agricultural and 11.35% developed. The remaining 4.31% is parks and open space.

The Watershed Over Time

The streams and ditches within the East Branch South Branch Kishwaukee River Watershed have undergone significant changes since the time of European settlement in the late 1800s. Two hundred years ago, the much of the watershed would have been comprised on wetlands and very few defined stream channels. The United States Township plat book survey for Virgil Township dated June 1877 indicates that Virgil Ditch #2 and Virgil Ditch #3 did not extend as stream channel north of the Town of Virgil. Additionally, Virgil Ditch #1 is not shown. Presumably, the watershed upstream of Town of Virgil was a wetland slough, falling gradually as it flowed westerly and southwesterly. The presence of the wetlands made agriculture difficult due to the presence of standing water. According to information provided by Kane County, the first recorded right-of-way for the construction of a portion of the Virgil Ditch system was issues to the Drainage Commissions of the Virgil Ditch Drainage District #1 of the Town of Virgil on October 31, 1883. Subsequent right-of-way permits were issued and a large percentage of the watershed's wetlands were filled and the ditches were installed to drain water away from agricultural fields. By the time the 1937 United States Geological Survey (USGS) Topographic Map was prepared, Virgil Ditches #1, #2, and #3 and Union Ditch #4 are shown in their current configuration.

Similarly in the DeKalb County portion of the watershed, significant alterations were made to the watershed in the late 1800s to early 1900s. On the Map of Cortland Township dated 1871, Union Ditch #1, Union Ditch #3, and the East Branch South Branch Kishwaukee River are shown in an alignment similar to what is present today. A wetland complex is identified in the current location of Union Ditch #2. By 1892, excavation of Union Ditch #2 has begun near the current location of downtown Maple Park. A large wetland complex is still present north of Maple Park separating Union Ditch #2 and Union Ditch #3. By 1908, the wetland complex has been drained and Union Ditch #2 flows directly into Union Ditch #3 and Union Ditch #1, Union Ditch #2, Union Ditch #3, and the East Branch South Branch Kishwaukee River are shown in their current configuration.

The Impact of Watershed Development

In the late 1800s as people moved into the watershed, they drained wetlands by excavating ditches as a means of removing water so that the land could be used for agriculture. It appears that the majority of the streams that make up Virgil Ditch #1, Virgil Ditch #2, Virgil Ditch #3, and Union Ditch #2 were manmade. These manmade ditches are unstable and channelized. Additionally, the natural occurring stream channels of Union Ditch #1, Union Ditch #3, and the East Branch South Branch Kishwaukee River were also channelized during the late 1800s and early 1900s as a means of increasing flow capacities to move water away from the agricultural field as quickly as possible.

There are problems resulting from the channelization of streams and manmade ditches. Channelization is detrimental for the health of streams and rivers through the elimination of suitable instream habitat for fish and wildlife by limiting the number of natural instream features such as pool-riffle sequences in the channel. Additionally, in many locations, a berm comprised of historic side-cast dredge spoils cuts off the stream channels from the floodplain.

Additionally, hydromodification, defined as human induced activities that change the dynamics of surface or subsurface flow, is prevalent in the watershed. Impacts from hydromodification can be seen as early as the late 1800s with the draining of wetlands, construction of the ditches, and the channelization of streams to increase agricultural production. Early settlers of the Midwest quickly realized that the soils found under wetlands and wet prairies were ideal for crop production once the water was removed. In order to "dry" the wetlands and the wet prairies, systems of sub-surface drainage tiles were installed in order to re-route the groundwater away from the wetlands and wet prairies and discharged into streams and ditches. Given that the drain tiles were drained by gravity flow, the receiving surface water needed to be a lower elevation than the tile. As such, ditches were installed and naturalized stream channels were often excavated to a deeper depth and straightened to facilitate quicker drainage of the fields. Once the water was removed, these areas could be put into successful agricultural production. This creation of agricultural land was at the cost of the loss of wetlands, wet prairies, and riparian habitat. Hydromodification attributed to the installation of drain tiles is prevalent throughout the East Branch South Branch Kishwaukee River.

Starting in the mid-1900s, the municipalities in the watershed including the City of Sycamore and the Villages of Cortland and Maple Park began to transition from rural communities into more suburban communities. This transition from rural to suburban is continuing to occur across the watershed as growth pressure increased from the communities located east and west of the watershed. Without proper planning, the transformation to a more suburban environment the East Branch South Branch Kishwaukee River watershed will begin to experience water quality and habitat degradation.

Under natural and undisturbed conditions, precipitation that falls onto the land surface is allowed to soak into the soil and become groundwater in a process referred to as infiltration or evaporated into the air by plants or from soil or surface waters in a process known as evapotranspiration. Typically, 75-90% of the rainfall either soaks into the ground or evaporates. Precipitation that is not infiltrated or evapotranspired is called runoff. Urban development in the watershed is reducing the amount of land available for the natural infiltration of rainfall into the ground (Figure 3). Instead of precipitation falling on vegetation where it can be infiltrated, it falls on parking lots, rooftops, and roads. The surfaces that prevent infiltration are known as impervious surfaces. From these impervious surfaces, the runoff is quickly conveyed into streams and creeks via a constructed drainage system comprised of drainage ditches, swales, and storm sewers. As a result, streams receive large pulses of water in shorter periods of time, resulting in erosion and destabilization of the stream channel and streambanks. As physical modification of the stream occurs, adjacent property can be damaged. Additionally, when the landscape or stormwater system is insufficient to contain these pulses of water, flooding can occur.

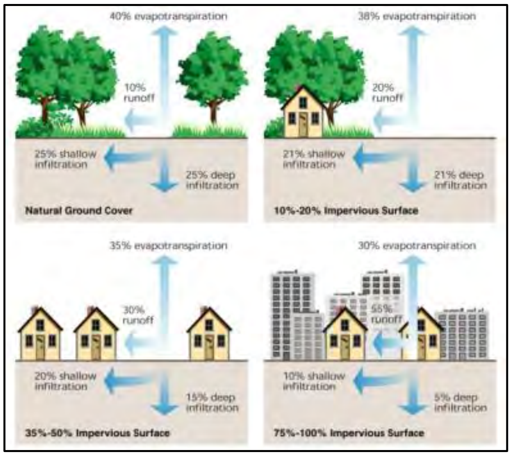


Figure 3: Impacts of increase urbanization on stormwater runoff (FISRWG)

In addition to the change of the volume and rate of runoff, pollutants such as oil and grease, road salt, eroding soil and sediment, metals, bacteria from pet wastes, and excess nutrients (nitrogen and phosphorus) from fertilizers are washed from streets, parking lots, construction sites, lawns, roofs, and golf courses into streams. This type of pollution is called nonpoint source pollution. Additional pollutants include increased water temperature, altered pH, and low dissolved oxygen levels, all of which can make the streams unhealthy for fish and other aquatic species.

Thus, the health of the East Branch South Branch Kishwaukee River Watershed is directly related to historical, current and future land use activities throughout the watershed. These activities not only impact the residents of the watershed but those of the communities, both human and natural, living downstream on the Kishwaukee River. Fortunately, there are proven measures and practices for addressing these impacts that watershed stakeholders can utilize to take positive action towards improving the watershed. One of the first steps in the process is to understand watershed problems and make a plan for moving forward – a watershed-based plan.

Watershed Planning

Watershed planning is a collaborative approach to addressing a variety of related water resource issues including water quality protection. This approach allows stakeholders to share information, better target limited financial resources, and address common water-related challenges. These challenges can include improving stream and lake water quality, preserving and protecting groundwater resources, managing stormwater, reducing soil erosion and flood damage, conserving open space, protecting wildlife habitat, providing safe recreational opportunities, supporting opportunities for economic development, and other issues of concern.

The following general steps were used in developing this watershed plan:

1. Conduct monthly meetings of the DeKalb County Watershed Steering Committee (DCWSC) with watershed stakeholders.
2. Solicit public input on watershed problems and opportunities to develop watershed goals and objectives.
3. Review and analyze existing studies, watershed conditions, and available watershed data to identify watershed problems and opportunities.
4. Identify best management practices (BMPs) and polices to improve water resources.
5. Develop a detailed watershed action plan and implementation plan.

Watershed Issues and Goals

Early in the planning process, DCWSC members, using input obtained from stakeholders during a public meeting, developed a list of watershed issues and concerns. Watershed concerns included:

- Non-point source runoff
    - Agricultural runoff (silt, pesticides, fertilizers, etc.)
    - Industrial runoff (oils, grease, etc.)
    - Fecal coliform/e. coli
- The ecological condition of the stream channels including lack of fish and wildlife habit
- Hydrologic modification (erosion, channelization, lack of riparian habitat, etc.)
- Development in the floodplain/Potential sources of non-point source pollution (oils, grease, etc.)
- Problem hydraulic structures (undersized culverts, bridges, etc.)
- Overbank flooding
- Stormwater management and drainage issues
- Uncompleted FEMA maps, especially the need for establishing base flow elevations in all Zone A areas

- Regulatory/enforcement differences between the ACOE Chicago District and the ACOE Rock Island District
- Funding challenges for large scale water quality/flood remediation projects

Figure 4 below includes photos of problem areas identified in the watershed Goals were drafted directly from the concerns expressed by the Watershed Steering Committee members and watershed stakeholders. The final goals were adopted on October 9, 2013 meeting and capture the desired outcomes and vision for East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) watershed. Objectives assigned to each goal are intended to be measurable so that the DCWSC can assess future progress made towards each goal. The goals are not listed by order of importance.

A. Protect and enhance overall surface and groundwater quality in the East Branch South Branch Kishwaukee River Watershed.
B. Reduce existing flood damage in the watershed and prevent flooding from worsening.
C. Improve aquatic and wildlife habitat in the East Branch South Branch Kishwaukee River watershed.
D. Develop open space in the East Branch South Branch Kishwaukee River watershed and provide recreational opportunities
E. Increase coordination between decision makers and other stakeholders in the watershed.
F. Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

Figure 4: Photos of Watershed Concerns

Watershed Inventory and Assessment

An assessment of watershed conditions was conducted based on available data, studies, and stakeholder input. The assessment includes information on stream corridor conditions, stormwater infrastructure, flooding, water quality, land use, wetlands, and other relevant information. This information not only provides a snapshot of current conditions but also serves as baseline data for comparing future watershed assessments. Four important conclusions based on this watershed assessment are summarized here.

1. Water quality is impacted by low dissolved oxygen levels and elevated levels of total suspended solids, bacteria and nutrients.
2. Stream channels are impacted by streambank erosion and channelization resulting from poor riparian management, flashy hydrology, unstable streambanks, and stormwater runoff.
3. The conversion of vacant, agricultural, or open land to urban uses has the potential to negatively impact water quality in the watershed.

4. Municipalities, residents, business owners, landowners, and other watershed stakeholders lack the coordination and communication necessary to improve watershed resources.

Watershed Best Management Practices (BMPs) and Solutions Toolbox

The watershed-based plan includes a description of BMPs and solutions that when properly applied can reduce stormwater impacts and improve water quality and stream habitat. The toolbox contains BMPs that can be implemented by all levels of watershed stakeholders from residents and landowners to municipalities. BMPs and solutions in the toolbox include:

- Stabilizing and restoring streambanks using bioengineering techniques.
- Installing rain gardens and bioinfiltration practices to help slow, infiltrate, cool, and cleanse stormwater runoff before being discharged into stream.
- Constructing new and retrofitting existing detention basins to help reduce volume and rate of stormwater released during storm events into streams.
- Reducing the area of impervious surfaces and using permeable pavements that allow water to infiltrate into the ground instead of running off as stormwater runoff.
- Restoring and maintaining native riparian buffers along stream and detention basins.
- Creation/restoration of wetlands to help slow, infiltrate, cool, and cleanse stormwater runoff before being discharged into stream

Prioritized Action Plan

The effectiveness of the East Branch South Branch Kishwaukee River Watershed-Based Plan will be largely dependent on the successful implementation of the Prioritized Action Plan by watershed stakeholders. The Action Plan serves as a roadmap for watershed improvement and provides the "who, what, where, and when." The Prioritized Action Plan includes programmatic, policy, and site-specific recommendations. Programmatic Actions are focused on watershed-wide action items that are not site specific while the Site Specific Action Plan identifies specific and actual locations where water quality, hydrological modification, and/or flood reduction/prevention projects can be implemented (Figure 5). The six most important general recommendations include:

1. Remediate existing flood problems and protect future flooding by reducing stormwater runoff and preserving and restoring areas for surface water storage such as depressional areas, floodplains, and wetlands. These areas also provide water quality improvement benefits.
2. Construct new and retrofit existing stormwater management system including detention basins and storm sewer outfall culverts to reduce runoff volume and rate and improve water quality in streams.
3. Reduce impervious areas by incorporating permeable pavements and bioinfiltration practices such depressed islands and rain gardens in parking lots and streets throughout the watershed.
4. Stabilize streambanks to reduce erosion, protect property and infrastructure, and improve water quality and habitat.
5. Provide public education and outreach to all watershed stakeholders as means of enhancing the understanding of watershed resources and provide opportunities for stakeholders to become involved in plan implementation.
6. Monitor and evaluate watershed plan implementation and changes in watershed conditions to gauge progress on reaching watershed goals.

Figure 5: Examples of BMPs that could be implemented in the watershed

Monitoring and Evaluation Plan

The final chapter of the watershed plan includes the Monitoring and Evaluation Plan. The Monitoring and Evaluation Plan was designed to provide a straightforward means of measuring progress towards watershed goals and plan implementation. Stakeholders should utilize this plan to monitor watershed resources and track whether meaningful progress is being made towards reaching the watershed-based plan's goals. The monitoring plan includes a series of Report Cards developed for each of the goals. The Report Cards are intended to provide a brief description of current conditions, suggest performance indicators that should be evaluated and monitored, milestones to be met, and remedial actions if milestones are not being met.

Where Do We Go From Here?

Historical land uses have played a significant role in the degradation of water resources in the East Branch South Branch Kishwaukee River Watershed. Fortunately, there are actions outlined in this plan can be taken to mitigate existing issues and prevent additional future problems. The future health of the watershed is largely dependent on how stormwater is managed. The business-as-usual approach using conventional development practices, stormwater management techniques and landscape management practices will result in a continued decline of the watershed resources and water quality. A new approach that includes proven and environmentally-sensitive practices and approaches to stormwater management can reverse this trend and begin to improve water quality and stream health in the watershed.

There is no single fix for the water quality and flooding problems in the East Branch South Branch Kishwaukee River Watershed. These problems are the cumulative result of decisions made since people moved to the watershed in the 1800s. It will take the decisions and actions of every stakeholder living in the watershed to work together to improve the health of the watershed. Likewise, actions will need to be taken on every scale from the individual lot to the neighborhood to the municipalities in order to positively impact watershed resources.

This watershed-based plan is the first step in helping watershed residents and stakeholders understand what can be done to restore the valuable resources of the East Branch South Branch Kishwaukee River Watershed.

List of Figures

List of Tables

Appendices

Chapter 1.0 Introduction

1.1 The East Branch South Branch Kishwaukee River Watershed

1.1.1 Current Watershed Setting

A watershed is a land area that contains a common set of streams or rivers that drains to a common body of larger water such as larger rivers, lakes, estuaries, wetlands, or even the ocean (Figure 1-1). Topography is the key element affecting this area of land. The boundary of a watershed is defined by the highest elevations surrounding the stream with water flowing towards the lower elevations within the watershed. Theoretically, a drop of rainwater that falls on the highest elevation within the watershed will eventually make it to the lowest point. Rainfall that falls outside this boundary will enter another watershed and flow to a different stream. Whether you know it or not, you live in a watershed. Watersheds exhibit a complex interaction between land, climate, water, vegetation, humans, and animals. Watersheds are shown to be dynamic, constantly seeking states of equilibrium while being affected by man-made influences and natural daily changes in weather and climate.

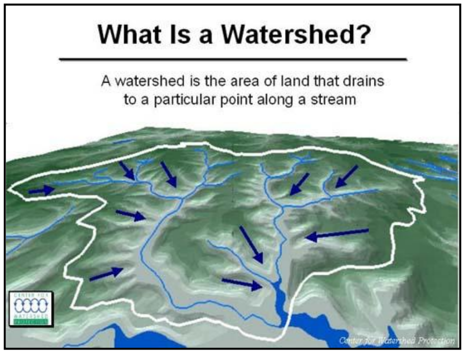


Figure 1-1 What is a watershed? (CWP)

Watersheds come in all shapes and sizes and can cross county, state, and even international borders. Other common names of watershed, depending on size, include basins, sub-basins, and catchments. For example, the United States Geological Survey (USGS) developed a national framework for categorizing watersheds based on geographical scale. This hierarchy of scales utilized a Hydrologic Unit Cataloging (HUC) system. The USGS HUC's divides all of the United State's watersheds into boundaries using four different classifications, and the cataloging unit is the smallest to define the watershed. The 8-digit HUC code (HUC 8) for the entire Kishwaukee River Watershed is 07090006. The 10-digit HUC code (HUC 10) for the South Branch Kishwaukee River Watershed is 0709000605. There are four (4) 12-digit HUC codes for the areas covered by this plan: 070900060504 (East Branch South Branch Kishwaukee River subwatershed), 070900060502 (eastern portion of Union Ditch subwatershed), 070900060503 (western portion of Union Ditch subwatershed) and 070900060501 (Virgil Ditch subwatershed).

The East Branch South Branch Kishwaukee River watershed is located in east-central DeKalb County and southwestern Kane County (Figure 3-1). The East Branch South Branch Kishwaukee River is a major tributary to the South Branch Kishwaukee River in DeKalb County, with the confluence about one mile west of Shabbona. The watershed drains approximately 123 square miles of land into the South Branch Kishwaukee River. The South Branch Kishwaukee River continues to flow west to its confluence with the Kishwaukee River. From this confluence, the Kishwaukee River flows westward through Rockford before joining the Rock River. The Rock River flows to the southwest before joining the Mississippi River in the Quad Cities area (Moline, Illinois; Rock Island, Illinois, Davenport, Iowa; and Bettendorf, Iowa).

The East Branch South Branch Kishwaukee River Watershed can be divided into 3 primary subwatersheds: Virgil Ditch, Union Ditch, and the East Branch South Branch Kishwaukee River (Figure 3-2). The Virgil Ditch subwatershed finds its headwaters in northwestern Kane County and flows south into Union Ditch. The Union Ditch system generally flows west from Kane County into DeKalb County and flows into the East Branch South Branch Kishwaukee River. As noted above, the East Branch South Branch Kishwaukee River is a major tributary to the South Branch Kishwaukee River.

Collectively, there are 72.7 stream miles in the East Branch South Branch Kishwaukee River Watershed: 21.3 miles attributed to East Branch South Branch Kishwaukee River, 13.7 miles of Virgil Ditch and 37.7 miles of Union Ditch. Available data indicates that 2,475 acres of wetlands are located within the East Branch South Branch Kishwaukee River watershed. There is one major surface impoundment in the watershed: Sycamore Lake. Sycamore Lake is 7.5 acres in size and is located within the East Branch South Branch Kishwaukee River subwatershed.

Two counties, eight municipalities and eleven townships comprise the East Branch South Branch Kishwaukee River watershed. Approximately 49.1% of the watershed is in DeKalb County and the remaining 50.9% in Kane County. Approximately 17.07% is incorporated in one of the eight municipalities: Village of Burlington, Village of Cortland, City of DeKalb Village of Elburn, Village of Lily Lake, Village of Maple Park, City of Sycamore, and Town of Virgil. The East Branch South Branch Kishwaukee River Watershed is approximately 84.34% agricultural and 11.35% developed. The remaining 4.31% is parks and open space.

The Illinois Environmental Protection Agency (Illinois EPA) has identified no impaired waters in The East Branch South Branch Kishwaukee River Watershed. However significant water quality concerns including channelization and hydromodification have been identified in the watershed. Erosion and sedimentation is prevalent along the waterways in the watershed. This plan aims at addressing identifying causes and sources of these impacts and developing programmatic and site specific recommendations for restoring the water quality and hydrology of the East Branch South Branch Kishwaukee River Watershed.

1.1.2 The Watershed Over Time

The streams and ditches within the East Branch South Branch Kishwaukee River Watershed have undergone significant changes since the time of European settlement in the late 1800s. Two hundred years ago, the much of the watershed would have been comprised on wetlands and very few defined stream channels. The United States Township plat book survey for Virgil Township dated June 1877 indicates that Virgil Ditch #2 and Virgil Ditch #3 did not extend as stream channel north of the Town of Virgil. Additionally, Virgil Ditch #1 is not shown. Presumably, the watershed upstream of Town of Virgil was a wetland slough, falling gradually as it flowed westerly and southwesterly. The presence of the wetlands made agriculture difficult due to the presence of standing water. According to information provided by Kane County, the first recorded right-of-way for the construction of a portion of the Virgil Ditch system was issues to the Drainage Commissions of the Virgil Ditch Drainage District #1 of the Town of Virgil on October 31, 1883. Subsequent right-of-way permits were issued and a large percentage of the watershed's wetlands were filled and the ditches were installed to drain water away from agricultural fields. By the time the 1937

United States Geological Survey (USGS) Topographic Map was prepared, Virgil Ditches #1, #2, and #3 and Union Ditch #4 are shown in their current configuration.

Similarly in the DeKalb County portion of the watershed, significant alterations were made to the watershed in the late 1800s to early 1900s. On the Map of Cortland Township dated 1871, Union Ditch #1, Union Ditch #3, and the East Branch South Branch Kishwaukee River are shown in an alignment similar to what is present today. A wetland complex is identified in the current location of Union Ditch #2. By 1892, excavation of Union Ditch #2 has begun near the current location of downtown Maple Park. A large wetland complex is still present north of Maple Park separating Union Ditch #2 and Union Ditch #3. By 1908, the wetland complex has been drained and Union Ditch #2 flows directly into Union Ditch #3 and Union Ditch #1, Union Ditch #2, Union Ditch #3, and the East Branch South Branch Kishwaukee River are shown in their current configuration.

1.1.3 Impacts of Watershed Development

As discussed above in Section 1.1.2, in the late 1800s as people moved into the watershed, they drained wetlands by excavating ditches as a means of removing water so that the land could be used for agriculture. It appears that the majority of the streams that make up Virgil Ditch #1, Virgil Ditch #2, Virgil Ditch #3, and Union Ditch #2 were manmade. These manmade ditches are unstable and channelized. Additionally, the natural occurring stream channels of Union Ditch #1, Union Ditch #3, and the East Branch South Branch Kishwaukee River were also channelized during the late 1800s and early 1900s as a means of increasing flow capacities to move water away from the agricultural field as quickly as possible.

There are problems resulting from the channelization of streams and manmade ditches. Channelization is detrimental for the health of streams and rivers through the elimination of suitable instream habitat for fish and wildlife by limiting the number of natural instream features such as pool-riffle sequences in the channel. Additionally, in many locations, a berm comprised of historic side-cast dredge spoils cuts off the stream channels from the floodplain.

Additionally, hydromodification, defined as human induced activities that change the dynamics of surface or subsurface flow, is prevalent in the watershed. Impacts from hydromodification can be seen as early as the late 1800s with the draining of wetlands, construction of the ditches, and the channelization of streams to increase agricultural production. Early settlers of the Midwest quickly realized that the soils found under wetlands and wet prairies were ideal for crop production once the water was removed. In order to "dry" the wetlands and the wet prairies, systems of sub-surface drainage tiles were installed in order to re-route the groundwater away from the wetlands and wet prairies and discharged into streams and ditches. Given that the drain tiles were drained by gravity flow, the receiving surface water needed to be a lower elevation than the tile. As such, ditches were installed and naturalized stream channels were often excavated to a deeper depth and straightened to facilitate quicker drainage of the fields. Once the water was removed, these areas could be put into successful agricultural production. This creation of agricultural land was at the cost of the loss of wetlands, wet prairies, and riparian habitat. Hydromodification attributed to the installation of drain tiles is prevalent throughout the East Branch South Branch Kishwaukee River.

Starting in the mid-1900s, the municipalities in the watershed including the City of Sycamore and the Villages of Cortland and Maple Park began to transition from rural communities into more suburban communities. This transition from rural to suburban is continuing to occur across the watershed as growth pressure increased from the communities located east and west of the watershed. Without proper planning, the transformation to a more suburban environment the East Branch South Branch Kishwaukee River watershed will begin to experience water quality and habitat degradation.

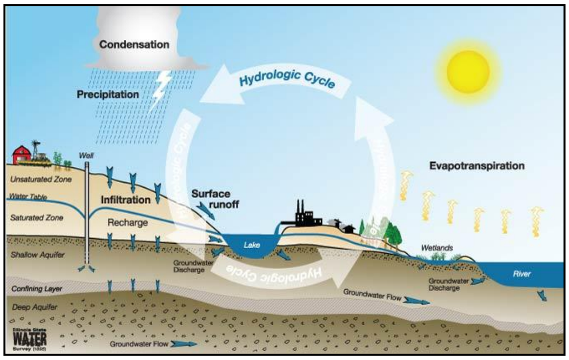


Figure 1-2: Hydrologic Cycle (ISWS)

Under natural and undisturbed conditions, precipitation that falls onto the land surface is allowed to soak into the soil and become groundwater in a process referred to as infiltration or evaporated into the air by plants or from soil or surface waters in a process known as evapotranspiration. Typically, 75-90% of the rainfall either soaks into the ground or evaporates. Precipitation that is not infiltrated or evapotranspired is called runoff. The runoff can be stored in wetlands or depressional areas where it can be infiltrated into the soil or flow across the vegetated land surface and into creeks, stream, rivers, and lakes. As the runoff passes through the vegetation, the flow of the water is slowed allowing for additional infiltration and reducing the potential for high flows to rush into the surface waters. Additionally, the flowing of the runoff through vegetation provides water quality benefits such as the settling out of soil and other solids and nutrient removal by plants. This process is known as the hydrologic cycle (Figure 1-2).

Suburban development in the watershed is reducing the amount of land available for the natural infiltration of rainfall into the ground. Instead of precipitation falling on vegetation where it can be infiltrated, it falls on parking lots, rooftops, and roads. The surfaces that prevent infiltration are known as impervious surfaces. From these impervious surfaces, the runoff is quickly conveyed into stream and creeks via a constructed drainage system comprised of drainage ditches, swales, and storm sewers. The discharge of runoff into the surface waters by the constructed drainage ditches is known as stormwater runoff.

Stormwater runoff tends to enter streams and creeks at a much more rapid rate than runoff from undeveloped areas. This rapid drainage results in what is called "flashy" hydrology. A "flashy" hydrology means that the water level in the stream rises very quickly during a storm and falls quickly afterward. Since less water is infiltrated into the ground to later seep out and create a steady base flow within the stream, low flows are considerably lower or less consistent. Likewise, because less water is absorbed by the ground and more water is flowing into the streams, high flows are considerably higher.

As a result of the higher flows, stream and creeks received large surges of water in short periods of time. These high flows cause erosion of the streambanks and/or streambeds. As the streambed erodes, the channel deepens and becomes more entrenched (or incised). If the streambed is composed of a stable substrate such as large gravel or stone or when structures provide grade control, the banks will erode and the channel will become wider instead of the channel deepening. As the physical modification of the stream occurs, adjacent property can be damaged.

The flows between these surges can include range from extremely low flows to no flows as there is limited groundwater to maintain baseflow to the creek. Decreased low flows degrade aquatic habitat because low flows have low levels of dissolved oxygen necessary for aquatic animals and because, in extreme cases, the stream can dry up completely for periods of time.

In addition, to problems created by the flashiness of the stream, the duration of high flows can also be a significant problem. High flows that cannot be contained within the stormwater conveyance system or within the stream channels can result in localized flooding of homes, business, and roads. This flooding is caused by over-bank topping, culvert backups, and storm sewer surges and backups. The resulting flooding caused property damage and can make travel difficult and unsafe due to standing water. The heavy flows damage stormwater infrastructure including culverts and discharge pipes by causing dislodgement or erosion around the infrastructure. The high flows also have the ability to carry debris including logs, branches, and trash which can be deposited in debris jams and block the conveyance system.

In addition to the change of the volume and rate of runoff, urbanization can also lead to increased pollutants loadings. This kind of pollution is called nonpoint source pollution. Unlike pollution from industrial and sewage treatment plants, nonpoint source pollution comes from many diffuse sources. Nonpoint pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, and ground waters.

Nonpoint source pollution can include:

- Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas;
- Oil, grease and toxic chemicals from urban runoff and energy production;
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks;
- Salt from roads and irrigation practices and acid drainage from abandoned mines;
- Bacteria and nutrients from livestock, pet wastes and faulty septic systems;
- Atmospheric deposition; and
- Hydromodification.

In addition to chemicals and other substances, nonpoint source pollution also includes other parameters that affect water quality such as temperature, pH, and the amount of oxygen in the water. Each of these parameters plays an important role in the health of aquatic organisms such as fish, macroinvertebrates, and other insects that live in and near streams and waterways. For example, aquatic organisms require oxygen that is dissolved in the water to live and propagate. Low flows and nonpoint sources of pollution can cause the dissolved oxygen levels to become so low that the organisms are killed or need to leave the area in order to find livable conditions.

Temperature is also critical for the health of aquatic organisms. Many fish require cool or cold flowing water in order to successfully breed and survive. Stormwater runoff is typically higher in temperature than the groundwater that feeds streams in an urbanized area. As stormwater runoff flows off of impermeable surfaces and through the stormwater infrastructure it is warmed, leading to elevated water temperatures in the receiving streams. Pollutants picked up along the way can also change the pH of the water making it more acidic or more alkaline. Significant changes towards acidic or alkaline can also have a negative impact on the health of a stream.

Many studies have shown a direct negative impact between the urbanization (or increase in impervious surface area) on water quality and stream health and increase risk of flooding. Thus, the health of the East Branch South Branch Kishwaukee River Watershed is directly related to land use activities throughout the watershed. These activities not only impact the residents of the watershed but all of those of the communities, both human and natural, living downstream on the South Branch Kishwaukee River.

1.1.4 Where Do We Go From Here

As discussed in Sections 1.1.2 and 1.1.3, land use changes from wetlands to agricultural to developed has played a significant role in the degradation of water resources in the East Branch South Branch Kishwaukee River Watershed and will continue to impact the watershed as development continues. Fortunately, there are actions that can be taken to mitigate existing issues and prevent additional future problems. This watershed-based plan outlines the recommended actions to restore water quality and stream health, and prevent and reduce flooding. The future health of the watershed is largely dependent on how stormwater is managed. The business-as-usual approach using conventional development practices, stormwater management techniques and landscape management practices will result in a continued decline of the watershed resources and water quality. A new approach that includes proven and environmentally-sensitive practices and approaches to stormwater management can reverse this trend and begin to improve water quality and stream health in the watershed.

There is no single fix for the water quality and flooding problems in the East Branch South Branch Kishwaukee River Watershed. These problems are the cumulative result of decisions made since the early 1900s. It will take the decisions and actions of every stakeholder living in the watershed to work together to improve the health of the watershed. Likewise, actions will need to be taken on every scale from the individual lot to the neighborhood to the municipalities to positively impact watershed resources.

This watershed-based plan is the first step in helping watershed residents and stakeholders understand what can be done to restore the valuable resources of the East Branch South Branch Kishwaukee River Watershed.

1.2 About this Watershed-Based Plan

1.2.1 Project Purpose

Watershed planning is a collaborative approach to addressing a variety of related water resource issues including water quality protection. This approach allows stakeholders to share information, better target limited financial resources, and address common water-related challenges. These challenges can include improving stream and lake water quality, preserving and protecting groundwater resources, managing stormwater, reducing soil erosion and flood damage, conserving open space, protecting wildlife habitat, providing safe recreational opportunities, supporting opportunities for economic development, and other issues of concern.

The scope of this project is to develop a watershed-based plan for the East Branch South Branch Kishwaukee River Watershed. The purpose of the plan is to address nonpoint-source pollution prevention and water resource protection needs in the East Branch South Branch Kishwaukee River Watershed as well as provide a unique forum for public education, involvement, outreach, and community-capacity building opportunities. If no action is taken, our watershed resources will continue to degrade. Water quality will continue to decline, streambank erosion will continue to erode and impact property and infrastructure and the potential for flooding will increase.

This plan provides information and a set of recommendations for municipalities, developers, residents, and others to effectively plan in a way that is appropriate for the protection of the watershed's resources. It provides guidance on water quality improvement, habitat restoration, development standards, and education and outreach programs.

1.2.2 DeKalb County Watershed Steering Committee

The DeKalb County Stormwater Management Committee, comprised of six County and six municipal members representing all 14 municipalities within the County's boundaries, has worked with the DeKalb County Community Foundation (DCCF) to undertake a watershed planning process in DeKalb County, Illinois. These organizations created the DeKalb County Watershed Steering Committee (DCWSC), which is a consortium of municipalities, resource agency professionals, environmental advocates, and local residents in the East Branch South Branch Kishwaukee River watershed. Members of the DCSWC include the Sycamore City Administrator, DeKalb County Soil & Water Conservation District; Village of Maple Park, Kane County Planning Department, members of the DeKalb County Stormwater Management Committee, the DeKalb County Engineer, the Cortland-Pierce Drainage District, and DeKalb County Community Foundation. After a discussion of water quality and stormwater problems and the need to coordinate the studies and planning required to implement solutions to the problems, it was agreed that DeKalb County would be the lead agency responsible for taking steps to formally organize the DCSWC and apply for the CWA Section 319 grant on behalf of the Committee. The DCCF Foundation also has a significant leadership role in the DCSWC and generously contributed $30,000 in cash as matching funds to the watershed-based planning process. The Section 319 grant was funded by the Illinois Environmental Protection Agency in Winter 2012 (See Section 1.2.3 for more information).

DCSWC met numerous times during the planning process to oversee the development of the watershed-based plan. In addition, a series of public meeting were held to inform the general public of the watershed planning process and solicit input on the plan. A list of meeting is included in Table 1-1. Copies of meeting minutes are included in Appendix A.

Table 1-1 Summary of DCSWC Activities

Meeting Number	Date	Meeting Type	Agenda / Topics Covered
1	January 9, 2013	DCWSC	• Watershed Planning Overview • Goals and Objectives • Watershed Steering Committee Membership
2	February 13, 2013	DCWSC	• Goals and Objectives • Public Meetings
3	March 7, 2013	Public Workshop	• Watershed Planning Overview • Goals and Objectives • Watershed Concerns
4	March 13, 2013	DCWSC	• Presentation by Sycamore Park District • Watershed Resource Inventory • Website and Logo
5	April 10, 2013	DCWSC	• Logo • Watershed Resource Inventory • Outreach Activities
6	April 10, 2013	Public Workshop	• Watershed Planning Overview • Goals and Objectives • Watershed Concerns
7	May 8, 2013	DCWSC	• Watershed Resource Inventory • Watershed Concerns
8	September 11, 2013	DCWSC	• Watershed Resource Inventory • Pollutant Load Modeling
9	September 19, 2013	Watershed Tour	• Watershed Overview • Best Management Practices (BMPs)
10	October 9, 2013	DCWSC	• Review of Watershed Tour • Pollutant Load Modeling • Identified Problem Areas
11	November 13, 2013	DCWSC	• Watershed Plan Format • BMP Fact Sheets • Pollutant Load Modeling • Action Plan
12	January 8, 2014	DCWSC	• Pollutant Load Modeling • Action Plan • Outreach Activities
13	February 5, 2014	DCWSC	• Pollutant Load Modeling • Action Plan • Outreach Activities

Meeting Number	Date	Meeting Type	Agenda / Topics Covered
14	March 12, 2014	DCWSC	• Action Plan • Outreach Activities
15	March 20, 2014	Public Workshop	• Watershed Planning Overview • Agricultural BMPs • Funding Sources for Agricultural BMPs
16	April 9, 2014	DCWSC	• Action Plan • Outreach Activities
17	April 24, 2014	Workshop for Decision Makers	• Watershed Planning Overview • Action Plan • Funding for Plan Implementation
18	May 16, 2014	DCWSC	• Action Plan • Outreach Activities • Website
19	June 12, 2014	Kane County Environmental Committee	• Presentation Watershed Plan Findings and Recommendations.
20	June 14, 2014	Watershed Tour	• Watershed Overview • Best Management Practices (BMPs)
21	June 19, 2014	Public Meeting	• Presentation of Final Plan

1.2.3 Project Funding

The project was initiated and funded by DeKalb County with a grant from the Illinois Environmental Protection Agency Section 319 grant program. The DeKalb County Community Foundation (DCCF) has also generously contributed $30,000 in cash as matching funds to the watershed-based planning process. Participating stakeholders contributed staff time to provide information and participate in the watershed planning progress.

1.2.4 Watershed-Based Plan Elements

The "Nonpoint Source Program and Grant Guidelines for States and Territories" written by United States Environmental Protection Agency (Illinois EPA) provides guidance for the production of Section 319 funded watershed-based plans. This guidance manual was created to ensure that all Section 319 funded projects including watershed-based plans are aimed at restoring waters impaired by nonpoint source pollution. The guidance manual outlines nine requirements that must be met by the plan in order for the plan to be considered a Watershed-Based Plan. These nine elements are:

1. Identification of causes and sources that will need to be controlled to achieve load reductions estimated within the plan;
2. Estimate of load reductions expected for management measures described in number 3 below;

3. Description of the non-point source pollution management measures that need to be implemented in order to achieve the load reductions estimated in number 2 above and an identification of critical areas
4. Estimate the amounts of technical and financial assistance needed; costs; and the sources and authorities that will be relied upon to implement the plan;
5. Information and public education component;
6. Implementation schedule;
7. Description of interim, measurable milestones for determining whether non-point source pollution measures or other actions are being implemented;
8. Criteria to measure success and re-evaluate the plan; and
9. Monitoring component to evaluate effectiveness of implementation efforts over time.

The East Branch South Branch Kishwaukee River Watershed -Based Plan meets all of the nine minimum criteria outlined by the USEPA. As such, the East Branch South Branch Kishwaukee River Watershed stakeholders will be able to apply for Section 319 funding for the implementation of non-point source pollution control projects outlined in the plan.

1.2.5 Prior Watershed Studies and Plans

Formed in 1996 the Kishwaukee River Ecosystem Partnership (KREP) is a coalition of groups and individuals working to protect the high quality natural resources of the Kishwaukee River Watershed. KREP has produced or assisted with the production of numerous reports related to water quality and habitat conditions in the Kishwaukee River:

- Kishwaukee River Subwatershed Reports, KREP, May 2005
- Sustainable Development Guide for Kishwaukee Watershed Municipalities, KREP and Environmental Defenders of McHenry County, 2000
- Kishwaukee River – Strategic Plan for Habitat Conservation and Restoration, January 2006
- Report on the Natural Resources and Habitat in the Kishwaukee River Watershed, KREP April 2004
- Critical Trends Assessment Program (CTAP) Kishwaukee River Area Assessment, Illinois Department of Natural Resources, 1998

While not specifically focused on the East Branch South Branch Kishwaukee River Creek Watershed, the information contained in these reports provides general information related to the health and condition of the Kishwaukee River watershed.

1.2.6 Process and Plan Organization

This watershed-based plan was produced via a comprehensive watershed planning approach that involved input from local residents, municipal officials, municipal employees, and representatives from natural resource agencies.

The DeKalb County Watershed Steering Committee (DCWSC) held meetings throughout 2013 to 2014 to direct the development of the watershed plan. In the Spring of 2012, DCWSC established goals and objectives to focus the watershed planning activities.

Information obtained from watershed stakeholders and numerous natural resource agencies was then used to assess the overall condition of the watershed including water quality, natural resources, and flood risks. Using this information, a series of recommended management practices aimed at improving the water quality and natural resources conditions of the watershed was developed. Potential funding sources and strategies for the implementation and monitoring of the identified recommended projects were also included in the watershed-based plan. Using the guidance provided by the "Guidance for Developing Actions Plans in Illinois" prepared by Chicago Metropolitan Planning Agency (CMAP), the format for the East Branch South Branch Kishwaukee River Creek Watershed-Based Plan includes five main sections.

- Goals and Objectives
- Water Resources Inventory and Assessment
- Stormwater Retrofit Toolbox
- Action Plan
- Monitoring Plan

Goal and Objectives

Watershed stakeholders developed a list of watershed issues, goals, and objectives. The major topics of concern included: hydromodification, water quality, flooding, watershed coordination, watershed hydrology, and instream habitat.

Water Resources Inventory and Assessment

The project planning team assessed watershed conditions and prepared a series of watershed maps based on data, studies, inventories, and stakeholder input. The assessment includes information on stream corridor conditions, stormwater infrastructure, flooding, water quality, land use, wetlands, and other relevant information. This information not only provides a snapshot of current conditions but also serves as baseline data for comparing future watershed assessments.

Stormwater Solutions Toolbox

After the watershed condition was determined, a stormwater solutions toolbox was assembled to identify the range of actions needed to improve watershed resources. This toolbox includes practices in the areas of policy and planning, development standards, stormwater management, erosion control, streambank stabilization, yard and landscape management, habitat restoration, natural area preservation, and flood reduction.

Prioritized Action Plan

The effectiveness of the East Branch South Branch Kishwaukee River Creek Watershed plan will be largely dependent on the quality of the action plan. The action plan provides the "who, what, where and when" for watershed improvement and includes programmatic (general) and site-specific recommendations. The site specific action items are tied to a particular location in the watershed or along the stream corridor, and they include details such as area, cost, responsibility, schedule, and priority.

Monitoring Plan

A monitoring and evaluation plan was developed to provide stakeholders and other implementers with a way to monitor watershed conditions and track whether meaningful progress is being made towards plan goals. The monitoring plan includes milestones, parties responsible for monitoring, and the frequency and method for collecting data.

1.3 Using This Plan

For those unfamiliar with watershed-based planning, this plan likely seems overwhelming. There are pages of information to absorb, tables to navigate, and numerous costly recommendations that a single resident could not possibly begin to implement. But there are simple, straightforward actions that each person can take immediately to help improve the watershed.

Remember that every action, no matter how small, can have an impact and improve watershed resources. The Executive Summary of the plan provides a concise overview of what this plan is all about. For additional details, browse the Table of Contents and flip to the relevant section, or refer to Table 1-2 and the suggestions that follow to help find more information.

Table 1-2 Priority Actions by Stakeholder Group

If you are a….	**Your top priority action items include:**
Resident	1. Join the Kishwaukee Ecosystem Partnership to stay engaged in watershed activities. 2. Restore native riparian buffers, and remove excess debris from stream channels. 3. Capture stormwater runoff using rain gardens, rain barrels or other retrofits and to avoid discharging roof and sump pump runoff directly to the stream. 4. Dispose of yard and municipal waste appropriately, not into stream channels, stormsewers or drainageways. 5. Do not construct structures such as sheds or gazebos in drainage ways or detention facilities.
Business owner	1. Manage your property appropriately by regularly cleaning parking lots and using environmentally-friendly lawn care practices. 2. Incorporate stormwater retrofits to reduce and slow stormwater runoff from your property.
Developer or Homebuilder	1. Incorporate stormwater best management practices into all new development and redevelopment sites aimed at slowing, infiltrating, storing, and cleaning stormwater runoff. 2. Use conservation development or low impact development for a new and redevelopment sites.
Government Official or Staff	1. Incorporate watershed-based plan recommendations into local plans, policies, and regulations. 2. Prepare a detailed stormwater management plan for the watershed. 3. Manage, retrofit, and stabilize the stormwater management system including detention basins, culverts, drainageways, and discharge pipes. 4. Modify and use planning and development standards, policies, and capital improvement plans and budgets to protect and enhance water quality. 5. Require the use of stormwater BMPs and/or stormwater retrofits in all new or redevelopment projects.

To find out….

…what this plan is intended to achieve, read about the watershed goals and objectives in Chapter 2.0.

…detailed information about the watershed, its resources, and problems, read the water resources inventory and assessment included in Chapter 3.0.

…to locate watershed problems close to your home or business, refer to the watershed maps included in Chapter 3.0 to find out what subbasin is closest to the area you are interested in. The maps and text in Chapter 3 will help you locate the watershed resources and problem areas near you.

…what can be done to prevent and mitigate water quality and flooding problems in the watershed, read Chapter 4.0, Stormwater Retrofit Tool Box and Chapter 5, Section 2, the Programmatic Action Plan.

…what types of solutions are available to fix a problem in a specific area, read Chapter 4.0, Stormwater Retrofit Tool Box and Chapter 5, Section 3, the Site Specific Action Plan. The Site Specific Action plan is presented by municipality.

…what king of funding is available for watershed projects, refer to Chapter 6, Section 3, Funding Sources.

Chapter 2.0 Goals and Objectives

2.1 East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) Watershed Steering Committee Goals

The East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) Watershed Steering Committee Steering Committee (Watershed Steering Committee) is a consortium of municipalities in the East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) watershed, resource agency professionals, environmental advocates, and local residents dedicated to the development of strategies to protect and restore East Branch South Branch Kishwaukee River and its tributaries. The Watershed Steering Committee's primary goal is to work effectively to improve water quality by reducing nonpoint source pollution inputs in the East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) watershed, reduce flooding and improve stream habitat, while engaging a wide range of audiences in the Steering Committee's efforts.

2.2 Watershed Goals and Objectives

One of the Watershed Steering Committee's first tasks was the discussion and establishment of goals for the East Branch South Branch Kishwaukee River watershed. Stakeholders included in the goal setting process included the members of the Watershed Steering Committee and watershed residents that attended the watershed public meetings.

At the February 13, 2013, March 13, 2013, September 8, 2013, and October 9, 2013, East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) Watershed Steering Committee meetings, committee members dedicated a significant portion of the committee meeting to the identification of watershed concerns and setting of watershed goals. See Appendix A for the minutes of Watershed Steering Committee meetings. Additionally, at the public meeting held on March 7, 2013 and April 10, 2013, attendees that included more than 100 watershed residents and representatives from various local and state agencies were asked to express their watershed concerns and vision for the watershed. As part of the public meeting, attendees were split into four breakout groups and asked to provide input on general and specific water quality and flooding concerns. The information provided by the attendees was utilized by Watershed Steering Committee in preparing the goals and objectives for the East Branch South Branch Kishwaukee River Watershed-Based Plan.

As discussed above, prior to setting goals, stakeholders were asked to communicate their concerns and vision for the East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) watershed. Stakeholder concerns included:

- Non-point source runoff
    - Agricultural runoff (silt, pesticides, fertilizers, etc)
    - Industrial runoff (oils, grease, etc)
    - Fecal coliform/e. coli

- The ecological condition of the stream channels including lack of fish and wildlife habit
- Hydrologic modification (erosion, channelization, lack of riparian habitat, etc)
- Development in the floodplain/Potential sources of non-point source pollution (oils, grease, etc)
- Problem hydraulic structures (undersized culverts, bridges, etc)
- Overbank flooding
- Stormwater management and drainage issues
- Uncompleted FEMA maps, especially the need for establishing base flow elevations in all Zone A areas
- Regulatory/enforcement differences between the ACOE Chicago District and the ACOE Rock Island District
- Funding challenges for large scale water quality/flood remediation projects

A detailed list of concerns including specific problem locations is included in Appendix B.

Goals were drafted directly from the concerns expressed by the Watershed Steering Committee members and watershed stakeholders. The final goals were adopted on October 9, 2013 meeting and capture the desired outcomes and vision for East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) watershed. Objectives assigned to each goal are intended to be measurable so that the Watershed Steering Committee can assess future progress made towards each goal. The goals are not listed by order of importance.

A. Protect and enhance overall surface and groundwater quality in the East Branch South Branch Kishwaukee River Watershed

   Objectives

   1) Implement stormwater best management practices (BMPs) throughout the watershed to improve water quality by reducing nonpoint source pollution.
   2) Restore riparian buffers along East Branch South Branch Kishwaukee River and its tributaries.
   3) Promote conservation tillage practices to reduce soil erosion and sedimentation
   4) Promote nutrient management both in the rural and urban setting to alleviate the over application of nutrients
   5) Encourage decision makers to undergo a groundwater study that includes detailed analysis of groundwater use and development of regulatory programs/recommendations aimed at protecting and improving groundwater quality.

B. Reduce existing flood damage in the watershed and prevent flooding from worsening

   Objectives

   1) Encourage decision makers to undertake a detailed hydraulic and hydrology study of the watershed.

2) Mitigate for existing flood damage by identifying parcels suitable for flood mitigation projects.
3) Reconnect channelized stream segments to the floodplain where feasible.
4) Implement stormwater best management practices (BMPs) throughout the watershed designed to reduce runoff and encourage infiltration.
5) Protect undeveloped floodplain from development.

C. Improve aquatic and wildlife habitat in the East Branch South Branch Kishwaukee River watershed

Objectives

1) Identify opportunities for improving habitat along degraded stream channels using a natural channel design.
2) Identify opportunities for wetland restoration, creation and preservation within the watershed.
3) Restore riparian buffers along East Branch South Branch Kishwaukee River and its tributaries.
4) Encourage local residents to utilize native species in their landscapes.
5) Identify opportunities for habitat improvements at parks and natural areas.

D. Develop open space in the East Branch South Branch Kishwaukee River watershed and provide recreational opportunities

Objectives

1) Identify open space along the waterways that would provide access to the waterway.
2) Identify open space aimed at protecting and preserving natural resources
3) Identify areas that can be used for multiple uses (trails, passive recreations)
4) Support DeKalb and Kane Counties' Future Land Use Plan which promotes conservation and open space corridors
5) Encourage private landowners to install filter strips or riparian buffers along stream corridors

E. Increase coordination between decision makers and other stakeholders in the watershed.

Objectives

1) Ensure communities adopt the East Branch South Branch Kishwaukee River Watershed-Based Plan.
2) Encourage the adoption and/or revision of comprehensive plans and ordinances that support the watershed plan's goals and objectives.
3) Encourage communities to continue to be an active member of the Watershed Steering Committee following plan development.

F. Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

Objectives

1) Provide watershed stakeholders with an outreach plan that gives them the skills needed to implement the watershed plan.
2) Develop an urban outreach program for communities that will focus on stormwater management. This may include rain gardens, bioswales, and rainwater capturing.
3) Promote conservation programs for the agricultural community including providing meetings and tours to showcase BMPs.
4) Introduce new concepts into agriculture such as "nutrient farming" or as sometime referred to as "pay for environmental services" programs.

Watershed Resource Inventory and Assessment

3.1 Introduction

An understanding of the unique features and natural processes associated with the East Branch South Branch Kishwaukee River watershed (including Virgil Ditch and Union Ditch), as well as the current and potential future condition, is critical to developing an effective watershed-based plan. This watershed inventory and assessment organizes, summarizes, and presents available watershed data in a manner that clearly communicates the issues and processes that are occurring in the watershed so that stakeholders living the East Branch South Branch Kishwaukee River watershed can make informed decisions about the watershed's future.

As part of the preparation of the Watershed Resource Inventory and Assessment, the DeKalb County Watershed Steering Committee collected and reviewed available watershed data, conducted an investigation of stream reaches in the field, and gathered input from watershed stakeholders. Examples of information investigated includes water quality, streambank erosion, soils, wetlands, flood damage areas, the detention and drainage system, population, and current and future land use.

Geographic Information System (GIS) software was used to compile, analyze, and display this detailed information in graphical and map format so that stakeholders can easily understand the condition and location of watershed resources. The amounts of different pollutants that are expected from various land uses to enter the East Branch South Branch Kishwaukee River was also investigated.

This chapter presents the results of the inventory and analysis in a series of maps, tables, graphs, and narrative format. A summary of the watershed assessment is included at the end of the chapter.

3.2 Watershed Setting

The East Branch South Branch Kishwaukee River watershed is located in east-central DeKalb County and southwestern Kane County (Figure 3-1). The East Branch South Branch Kishwaukee River is a major tributary to the South Branch Kishwaukee River in DeKalb County, with the confluence about one mile west of Shabbona. The watershed drains approximately 123 square miles of land into the South Branch Kishwaukee River. The South Branch Kishwaukee River continues to flow west to its confluence with the Kishwaukee River. From this confluence, the Kishwaukee River flows westward through Rockford before joining the Rock River. The Rock River flows to the southwest before joining the Mississippi River in the Quad Cities area (Moline, Illinois; Rock Island, Illinois, Davenport, Iowa; and Bettendorf, Iowa).

3.3 Water Resources

The East Branch South Branch Kishwaukee River watershed can be divided into 3 primary subwatersheds: Virgil Ditch, Union Ditch, and the East Branch South Branch Kishwaukee

River (Figure 3-2). The Virgil Ditch subwatershed finds its headwaters in northwestern Kane County and flows south into Union Ditch. The Union Ditch system generally flows west from Kane County into DeKalb County and flows into the East Branch South Branch Kishwaukee River. As noted above, the East Branch South Branch Kishwaukee River is a major tributary to the South Branch Kishwaukee River.

Collectively, there are 72.7 stream miles in the East Branch South Branch Kishwaukee River watershed: 21.3 miles attributed to East Branch South Branch Kishwaukee River, 13.7 miles of Virgil Ditch and 37.7 miles of Union Ditch. Available data indicates that 2,475 acres of wetlands are located within the East Branch South Branch Kishwaukee River watershed. There is one major surface impoundment in the watershed: Sycamore Lake. Sycamore Lake is 7.5 acres in size and is located within the East Branch South Branch Kishwaukee River subwatershed.

The streams and ditches within the East Branch South Branch Kishwaukee River Watershed have undergone significant changes since the time of European settlement in the late 1800s. Two hundred years ago, much of the watershed would have been comprised of wetlands and very few defined stream channels. The United States Township plat book survey for Virgil Township dated June 1877 indicates that Virgil Ditch #2 and Virgil Ditch #3 did not extend as stream channel north of the Town of Virgil. Additionally, Virgil Ditch #1 is not shown. Presumably, the watershed upstream of Town of Virgil was a wetland slough, falling gradually as it flowed westerly and southwesterly. The presence of the wetlands made agriculture difficult due to the presence of standing water. According to information provided by Kane County, the first recorded right-of-way for the construction of a portion of the Virgil Ditch system was issued to the Drainage Commissions of the Virgil Ditch Drainage District #1 of the Town of Virgil on October 31, 1883. Subsequent right-of-way permits were issued and a large percentage of the watershed's wetlands were filled and the ditches were installed to drain water away from agricultural fields. By the time the 1937 United States Geological Survey (USGS) Topographic Map was prepared, Virgil Ditches #1, #2, and #3 and Union Ditch #4 are shown in their current configuration.

Similarly in the DeKalb County portion of the watershed, significant alterations were made to the watershed in the late 1800s to early 1900s. On the Map of Cortland Township dated 1871, Union Ditch #1, Union Ditch #3, and the East Branch South Branch Kishwaukee River are shown in an alignment similar to what is present today. A wetland complex is identified in the current location of Union Ditch #2. By 1892, excavation of Union Ditch #2 had begun near the current location of downtown Maple Park. A large wetland complex was still present north of Maple Park separating Union Ditch #2 and Union Ditch #3. By 1908, the wetland complex had been drained and Union Ditch #2 flowed directly into Union Ditch #3. Also by 1908, Union Ditch #1, Union Ditch #2, Union Ditch #3, and the East Branch South Branch Kishwaukee River were shown in their current configuration.

3.4 Geology/Topography

During the Pleistocene Era or "Ice Age" advancing and receding glaciers covered much of North America. The Illinoian glacier extended to southern Illinois between 300,000 and 125,000 years ago. It is the Illinoian glacier that is responsible for the flat, farm-rich areas in the southern half of the state. The northeastern portion of Illinois including the study watershed area was also covered by the most recent glacial event known as the Wisconsinan. The Wisconsinan began approximately 70,000 years ago and ended around 14,000 years ago. It was during this time that the temperatures began to rise and the ice retreated to form a landscape similar to the Alaskan tundra. As the temperatures began to rise, the tundra was replaced by cool moist deciduous forests, and eventually oak-hickory forests and prairies. The final retreat of the Lake Michigan lobe of the Wisconsin glacier is responsible for the formation of the Great Lakes and the landscape of the watershed. This landscape contains moraines, flood plains, bogs, outwash plains, lake plains, beaches, stream terraces, kames, ridges, and kettle holes (wetlands, ponds, and lakes).

The soils found in the watershed have been derived from Wisconsin Age glacial tills, glacial outwash, loess, and alluvium. The surface soil layer and subsoils found in the watershed are typically a silty clay loam. Underlying material is generally clay loam with strata of sand and gravel. The bedrock beneath is Ordovician Age assigned to the Maquoketa and Galena Groups.

Topography refers to the elevations of landscape that describes the configuration of its surface. Topography is an essential tool in the watershed planning process because topography defines the boundaries of the East Branch South Branch Kishwaukee River watershed. For this watershed-based plan, the Online Watershed Delineation (HYMAPS-OWL) tool, created by Department of Agriculture and Biological Engineering at Purdue University was use to create the initial subwatershed boundaries. The subwatershed (also referred to as subbasin) boundaries generated by HYMAPS-OWL were then cross referenced with boundaries obtained by inputting 2-foot topography into the GIS-based model, Arc Hydro. This combined data generated a Digital Elevation Model (DEM) that was used to delineate and refine the watershed and subwatershed boundaries for East Branch South Branch Kishwaukee River including the Union Ditch and Virgil Ditch watersheds. Inconsistencies in the two model's delineations were adjusted to reflect real-world conditions and more accurately depict the hydrologic boundaries. Most of these inconsistencies occurred in areas divided by roadways that were not accounted for the in the model. Figure 3-3 depicts the DEM and boundary of East Branch of the South Branch Kishwaukee River watershed.

The East Branch South Branch Kishwaukee River watershed generally drains from east to west to the South Branch Kishwaukee River.

3.5 Climate and Precipitation

3.5.1 Climate

Illinois is situated midway between the Continental Divide and the Atlantic Ocean and is often times underneath the polar jet-stream. The polar jet-stream is a focal point for movement between cold polar air masses from the north moving southward and warmer, tropical air from the south moving northward. The convergence of polar and tropical air causes Illinois to have a humid continental climate with hot humid summers and cool to cold winters with short frequent fluctuations in wind direction, cloudiness, humidity, and temperature.

Data collected in Sycamore, Illinois best represents the overall climate and weather patterns experienced in the watershed. The average annual temperature for the watershed is 54°F. The winter months (December – February) are cold with an average temperature of 31°F with the lowest temperature on record of -27°F recorded in 1985. There is an average of 100 annual days below freezing. The summer months are hot and humid with an average temperature of 81.3°F. The highest temperature on record for Sycamore, Illinois is 103°F recorded in 1988. The prevailing winds are west-northwest from November through May and south-southwest from June through October.

3.5.2 Precipitation

Average yearly precipitation for Illinois varies from just over 48 inches at the southern tip of the state to just under 32 inches in the northern portion of the state. May and June are the wettest months of the year. Flooding is the most damaging weather hazard within the state. Increased warming within urban heat islands leads to an increase in rainfall downwind of cities. Lake Michigan leads to an increase in winter precipitation along its south shore due to lake effect snow forming over the relatively warm lakes. Normal annual snowfall exceeds 38 inches in Chicago, and the southern portion of the state normally receives less than 14 inches. Storms exceeding the normal winter value are possible within one day. In summer, the relatively cooler lake leads to a more stable atmosphere near the lake shore, reducing rainfall potential. Illinois averages around 50 days of thunderstorm activity a year which put it somewhat above average for number of thunderstorm days for the United States. Illinois is also vulnerable to tornadoes with an average of 35 occurring annually.

The average annual rainfall for the watershed is 35.3 inches. Average snowfall for the area is 31 inches. The wettest month of the year is June with an average rainfall of 4.49 inches.

3.6 Soils

Deposits left during by the Lake Michigan lobe of the Wisconsin glacier are the raw materials of the soils currently found in the East Branch South Branch Kishwaukee River watershed. A combination of biological, physical, and chemical variables such as climate, drainage patterns, vegetation, and topography have all interacted together to form the soils found today.

Soil properties are key components to consider when designing and implementing water quality and flood reduction Best Management Practices (BMPs). Some soils are saturated for extended periods of time throughout the year and become what are referred to as hydric soils. Hydric soils generally hold water or infiltrate water very slowly. These properties are the reason why tiles are found utilized in areas with hydric soils and through the breaking of these tiles, wetland hydrology may be able to be restored.

Soils also exhibit different infiltration capabilities. Knowing the infiltration capabilities of the watershed's soils will allow for the proper placement of infiltration BMPs, as well as the location of wetland creation/restoration projects and detention basins.

Soils also exhibit differences in erodibility depending on their composition and slope. Erodibility of soils is especially important on construction sites where improper installation and maintenance of soil erosion and sediment control practices can lead to the release of sediment into creeks and lakes.

The 2004 DeKalb County and 2003 Kane County Natural Resource Conservation Services' (NRCS) Soil Survey were used to conduct a soil analysis for the watershed. The data was used to map the soil series, extent of hydric soils, soil susceptibility to erosion, and the infiltration capacity.

3.6.1 Soil Series

Soils are identified by a name associated with each series or class of soils with similar characteristics. A soil series is commonly derived from a town or landmark in or near the areas where the soil series was first identified, although sometimes naming conventions vary by county. Soil series are differentiated based on the amounts and size of particles making up the soil, water-holding capacity, the slopes where they are located, permeability characteristics, and organic content.

Tables 3-1 through 3-3 and Figures 3-4 through 3-6 list the dominant soil series located within the watershed by major subwatersheds: East Branch South Branch Kishwaukee River, Union Ditch and Virgil Ditch.

Table 3-1 Soil Series in the East Branch South Branch Kishwaukee River Subwatershed

Soil Code	Soil Name	Hydric	Erosivity	Soil Group	Acreage	% of Subwatershed
512B	Danabrook silt loam	-	MODERATE	B	3158.49	13.04%
356A	Elpaso silty clay loam	Yes	MODERATE	B/D	3031.58	12.51%
152A	Drummer silty clay loam	Yes	MODERATE	B/D	2911.39	12.02%
348B	Wingate silt loam	-	MODERATE	B	1880.87	7.76%
154A	Flanagan silt loam	-	MODERATE	B	1511.69	6.24%
3076A	Otter silt loam	Yes	MODERATE	B/D	1396.60	5.77%
171B	Catlin silt loam	-	MODERATE	B	1075.67	4.44%
193B	Mayville silt loam	-	HIGH	B	770.22	3.18%
62A	Herbert silt loam	-	MODERATE	B	675.57	2.79%
198A	Elburn silt loam	-	MODERATE	B/D	656.41	2.71%
662B	Barony silt loam	-	MODERATE	B	607.36	2.51%
667A	Kaneville silt loam	-	MODERATE	B	554.52	2.29%
221B2	Parr silt loam	-	MODERATE	B	527.17	2.18%

Soil Code	Soil Name	Hydric	Erosivity	Soil Group	Acreage	% of Subwatershed
656B	Octagon silt loam	-	MODERATE	B	495.59	2.05%
667B	Kaneville silt loam	-	MODERATE	B	417.62	1.72%
104A	Virgil silt loam	-	MODERATE	B	397.39	1.64%
668B	Somonauk silt loam	-	HIGH	B	386.92	1.60%
219A	Millbrook silt loam	-	MODERATE	B	348.29	1.44%
221C2	Parr silt loam	-	MODERATE	B	331.04	1.37%
668A	Somonauk silt loam	-	HIGH	B	292.07	1.21%
662A	Barony silt loam	-	MODERATE	B	274.97	1.14%
67A	Harpster silty clay loam	Yes	MODERATE	B/D	266.71	1.10%
60C2	La Rose loam	-	MODERATE	B	215.83	0.89%
512C2	Danabrook silt loam	-	MODERATE	B	206.35	0.85%
865	Pits, gravel	-	-	-	175.36	0.72%
656C2	Octagon silt loam	-	MODERATE	B	159.00	0.66%
59A	Lisbon silt loam	-	MODERATE	B	156.02	0.64%
348A	Wingate silt loam	-	MODERATE	B	145.80	0.60%
171A	Catlin silt loam	-	MODERATE	B	123.08	0.51%

There are 56 soil series found in the East Branch of the South Branch Kishwaukee River subwatershed. Of these 56, 29 are considered dominant soil types (greater than 0.5% of the watershed). The remaining 27 soils have been classified as “non-dominant soils”. The “non-dominant” soils cover 4.44% of the East Branch of the South Branch Kishwaukee River subwatershed.

Danabrook silt loam is the predominant soil type in the watershed, covering 3158.49 acres or approximately 13.09% of the watershed. Elpaso silty clay loams are the next most dominant soil series covering approximately 12.51% or 3031.58 acres of the watershed. The majority of the soils located in the watershed are well drained, non-hydric soils. Native plant communities in the watershed were likely comprised of prairie grasses, forest, woodlands, and savannas.

Table 3-2 Soil Series in the Union Ditch Subwatershed

Soil Code	Soil Name	Hydric	Erosivity	Soil Group	Acreage	% of Subwatershed
152A	Drummer silty clay loam	Yes	MODERATE	B/D	8558.63	23.00%
356A	Elpaso silty clay loam	Yes	MODERATE	B/D	2577.00	6.93%
512B	Danabrook silt loam	-	MODERATE	B	2403.38	6.46%
193B	Mayville silt loam	-	HIGH	B	1314.04	3.53%
154A	Flanagan silt loam	-	MODERATE	B	1239.37	3.33%
3076A	Otter silt loam	Yes	MODERATE	B/D	1236.85	3.32%
667B	Kaneville silt loam	-	MODERATE	B	1236.34	3.32%
662B	Barony silt loam	-	MODERATE	B	1235.57	3.32%
104A	Virgil silt loam	-	MODERATE	B	1073.11	2.88%
668B	Somonauk silt loam	-	HIGH	B	1053.87	2.83%
656B	Octagon silt loam	-	MODERATE	B	973.89	2.62%
149A	Brenton silt loam	-	MODERATE	B	805.09	2.16%
198A	Elburn silt loam	-	MODERATE	B/D	793.76	2.13%
667A	Kaneville silt loam	-	MODERATE	B	764.52	2.05%
656C2	Octagon silt loam	-	MODERATE	B	743.66	2.00%
219A	Millbrook silt loam	-	MODERATE	B	703.44	1.89%
103A	Houghton muck	Yes	-	A/D	669.86	1.80%
348B	Wingate silt loam	-	MODERATE	B	660.17	1.77%
62A	Herbert silt loam	-	MODERATE	B	639.59	1.72%
171B	Catlin silt loam	-	MODERATE	B	509.10	1.37%
662A	Barony silt loam	-	MODERATE	B	491.29	1.32%
512C2	Danabrook silt loam	-	MODERATE	B	440.71	1.18%
663A	Clare silt loam	-	MODERATE	B	437.91	1.18%
527B	Kidami silt loam	-	MODERATE	B	434.19	1.17%
59A	Lisbon silt loam	-	MODERATE	B	358.29	0.96%

Soil Code	Soil Name	Hydric	Erosivity	Soil Group	Acreage	% of Subwatershed
668A	Somonauk silt loam	-	HIGH	B	340.43	0.91%
330A	Peotone silty clay loam	Yes	MODERATE	C/D	322.68	0.87%
527C2	Kidami loam	-	MODERATE	B	312.72	0.84%
67A	Harpster silty clay loam	Yes	MODERATE	B/D	306.15	0.82%
171A	Catlin silt loam	-	MODERATE	B	303.15	0.81%
663B	Clare silt loam	-	MODERATE	B	297.83	0.80%
134C2	Camden silt loam	-	HIGH	B	281.99	0.76%
221B2	Parr silt loam	-	MODERATE	B	250.54	0.67%
680B	Campton silt loam	-	HIGH	B	242.12	0.65%
221C2	Parr silt loam	-	MODERATE	B	210.08	0.56%
512A	Danabrook silt loam	-	MODERATE	B	203.51	0.55%

There are 90 soil series found in the Union Ditch subwatershed. Of these 90, 36 are considered dominant soil types (greater than 0.5% of the watershed). The remaining 54 soils have been classified as "non-dominant soils". The "non-dominant" soils cover 7.49% of the Union Ditch subwatershed.

Drummer silty clay is the predominant soil type in the watershed, covering 8558.63 acres or approximately 23% of the watershed. Elpaso silty clay loams are the next most dominant soil series covering approximately 6.95% or 2577 acres of the watershed. The majority of the soils located in the watershed are well drained, non-hydric soils. Native plant communities in the watershed were likely comprised of prairie and forested areas.

Table 3-3 Soil Series in the Virgil Ditch Subwatershed

Soil Code	Soil Name	Hydric	Erosivity	Soil Group	Acreage	% of Subwatershed
152A	Drummer silty clay loam	Yes	MODERATE	B/D	5809.16	33.47%
193B	Mayville silt loam	-	HIGH	B	1346.62	7.76%
668B	Somonauk silt loam	-	HIGH	B	625.89	3.61%
656B	Octagon silt loam	-	MODERATE	B	591.85	3.41%
149A	Brenton silt loam	-	MODERATE	B	510.91	2.94%

Soil Code	Soil Name	Hydric	Erosivity	Soil Group	Acreage	% of Subwatershed
662B	Barony silt loam	-	MODERATE	B	510.59	2.94%
219A	Millbrook silt loam	-	MODERATE	B	442.87	2.55%
356A	Elpaso silty clay loam	Yes	MODERATE	B/D	442.28	2.55%
62A	Herbert silt loam	-	MODERATE	B	379.14	2.18%
656C2	Octagon silt loam	-	MODERATE	B	345.63	1.99%
104A	Virgil silt loam	-	MODERATE	B	337.41	1.94%
59A	Lisbon silt loam	-	MODERATE	B	314.48	1.81%
527B	Kidami silt loam	-	MODERATE	B	301.21	1.74%
527C2	Kidami loam	-	MODERATE	B	281.82	1.62%
134C2	Camden silt loam	-	HIGH	B	247.39	1.43%
668A	Somonauk silt loam	-	HIGH	B	245.58	1.41%
193C2	Mayville silt loam	-	HIGH	B	229.72	1.32%
527D2	Kidami loam	-	MODERATE	B	227.97	1.31%
523A	Dunham silty clay loam	Yes	MODERATE	B/D	204.42	1.18%
696B	Zurich silt loam	-	HIGH	C	203.52	1.17%
67A	Harpster silty clay loam	Yes	MODERATE	B/D	201.34	1.16%
154A	Flanagan silt loam	-	MODERATE	B	173.32	1.00%
662A	Barony silt loam	-	MODERATE	B	166.13	0.96%
348B	Wingate silt loam	-	MODERATE	B	155.59	0.90%
512B	Danabrook silt loam	-	MODERATE	B	155.18	0.89%
526A	Grundelein silt loam	-	MODERATE	B	150.66	0.87%
369A	Waupecan silt loam	-	MODERATE	B	140.71	0.81%
791A	Rush silt loam	-	HIGH	B	138.95	0.80%
330A	Peotone silty clay loam	Yes	MODERATE	C/D	137.50	0.79%
198A	Elburn silt loam	-	MODERATE	B/D	128.93	0.74%
343A	Kane silt loam	-	MODERATE	B	122.78	0.71%
329A	Will loam	Yes	MODERATE	B/D	121.20	0.70%

Soil Code	Soil Name	Hydric	Erosivity	Soil Group	Acreage	% of Subwatershed
680A	Campton silt loam	-	HIGH	B	120.54	0.69%
667B	Kaneville silt loam	-	MODERATE	B	106.90	0.62%
792A	Bowes silt loam	-	MODERATE	B	104.33	0.60%
663A	Clare silt loam	-	MODERATE	B	98.94	0.57%
103A	Houghton muck	Yes	-	A/D	94.73	0.55%
680B	Campton silt loam	-	HIGH	B	88.39	0.51%
697A	Wauconda silt loam	-	MODERATE	B/D	87.99	0.51%

There are 85 soil series found in the Virgil Ditch subwatershed. Of these 85, 39 are considered dominant soil types (greater than 0.5% of the watershed). The remaining 46 soils have been classified as "non-dominant soils". The "non-dominant" soils cover 7.29% of the Virgil Ditch subwatershed.

Danabrook silt loam is the predominant soil type in the watershed, covering 5809.16 acres or approximately 33.47% of the watershed. Elpaso silty clay loams are the next most dominant soil series covering approximately 7.76% or 1346.62 acres of the watershed. The majority of the soils located in the watershed are well drained, non-hydric soils. Native plant communities in the watershed were likely comprised of prairies and forested areas.

3.6.2 Hydric Soils

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that are formed under conditions of saturation, flooding, or ponding and retain moisture long enough during the growing season to develop anaerobic (oxygen-deprived) conditions in the soil layers closest to the surface. Hydric soils are important because they indicate the presence of existing or historical wetlands and digressional areas. Thus areas of hydric soils may be suitable for wetland restoration. Often, drain tiles are found in areas of hydric soils but because the tiles are draining water away from the area, wetlands that were once present are no longer present. By breaking these tiles and restoring the natural flow of water to these areas, wetland hydrology can potentially be restored and with a properly designed excavation, planting and management plan, a high quality wetland can be established. Table 3-4 identifies the percent coverage of hydric soils in each subwatershed and Figure 3-7 displays the coverage of hydric soils.

Table 3-4 Percent Coverage of hydric and non-hydric soils in the East Branch South Branch Kishwaukee River Watershed

Soil	Total area (acres)	Percentage of Subwatershed
East Branch South Branch Kishwaukee River Subwatershed		
Non-Hydric Soils	16,617.65	68.6%
Hydric Soils	7606.28	31.40%
Total	24,223.93	100%
Union Ditch Subwatershed		
Non-Hydric Soils	23,539.96	63.26%
Hydric Soils	13,671.16	36.74%
Total	37,211.12	100%
Virgil Ditch Subwatershed		
Non-Hydric Soils	10,348.11	59.61%
Hydric Soils	7,010.64	40.39%
Total	17,358.75	100%

3.6.3 Soil Erodibility

Soil erosion and sedimentation are significant causes of degraded water quality in Illinois. Soil erosion is the process in which soil is detached and moved by flowing water, wave action or wind. Through erosion, sediment is transported from its original location and deposited in a new location such as a stream, river, lake, or other ground surface. This deposition process is commonly referred to as sedimentation. The movement of eroded soils into streams, rivers, and lakes affects water quality chemically, biologically, and physically. Damage from sediment can be expensive both environmentally and economically. Over time, sediment deposits can blanket rock, cobble, and sandy substrate needed by fish and macroinvertebrates for habitat, food, and reproduction; reduce useful storage volumes in ponds, reservoirs, and lakes; and increase the need for costly water filtration systems for municipal drinking water supplies. Often times, the impacts of erosion and sedimentation are additive and the effects and costs of the sedimentation can be severe, both for those immediately affected and for those who must mitigate subsequent problems.

A map identifying the highly erodible soils in the watershed was created (Figure 3-8) by selecting soils that have been classified as highly erodible by the Natural Resource Conservation Service (NRCS). It is important to map the highly erodible soils because they represent those areas that have the highest potential to degrade water quality. As identified in Table 1-5, 10.06% (7,928.25 acres) of the watershed is comprised of highly erodible soils. This includes 5.98% (1,449.21 acres) of the soils within the East Branch South Branch Subwatershed, 8.69% (3,232.46 acres) of the soils within the Union Ditch Subwatershed, and 18.70% (3,246.58) of the soils in the Virgil Ditch Subwatershed. It should also be noted that all remaining dominant soils in each of the three subwatersheds are considered moderately erodible soils.

Table 3-5 Highly erodible soils in the East Branch of the South Branch Kishwaukee River Watershed

Soil Name	Soil Code	Acres	Percent of Subwatershed
East Branch South Branch Kishwaukee River Subwatershed			
193B	Mayville silt loam	770.22	3.18%
668A	Somonauk silt loam	292.07	1.21%
668B	Somonauk silt loam	386.92	1.60%
	Total	1,449.21	5.98%
Union Ditch Subwatershed			
134C2	Camden silt loam	281.99	0.76%
193B	Mayville silt loam	1314.04	3.53%
668A	Somonauk silt loam	340.43	0.91%
668B	Somonauk silt loam	1053.87	2.83%
680B	Campton silt loam	242.12	0.65%
	Total	3,232.46	8.69%
Virgil Ditch Subwatershed			
134C2	Camden silt loam	247.39	1.43%
193B	Mayville silt loam	1346.62	7.76%
193C2	Mayville silt loam	229.72	1.32%
668A	Somonauk silt loam	245.58	1.41%
668B	Somonauk silt loam	625.89	3.61%
680A	Campton silt loam	120.54	0.69%
680B	Campton silt loam	88.39	0.51%
696B	Zurich silt loam	203.52	1.17%
	Total	3,246.58	18.70%

3.6.4 Soil Infiltration Capabilities (Hydrologic Soil Groups)

The permeability and surface runoff potential of the soils in the United States have been classified by the NRCS into Hydrologic Soil Groups (HSGs). HSGs are based on a soil's infiltration and transmission (or permeability) rates and are used by engineers to estimate runoff curve numbers. Runoff curve numbers are an estimate of runoff potential of different soil types with different land covers. The curve numbers allow engineers to estimate the approximate amount of direct runoff from a rainfall event in a particular area and design new development in that area in a way which stormwater runoff is controlled. HSGs are classified into four primary categories: A, B, C, and D, and three dual classes, A/D, B/D, and C/D.

- Group A is comprised of the most permeable soil types and have the lowest runoff potential. These soils consist of mainly deep, well drained to excessively drained sands or gravelly sands. Group A soils have a high rate of water transmission.
- Group B soils have a moderate infiltration rate and are moderately deep, moderately well drained or well drained with fine texture to moderately course texture (silt and sand). Group B soils have a moderate rate of water transmission.
- Group C soils have slow infiltration rates because of a fine texture soil layer comprised of silt and clay that impedes the downward migration of water. Group C soils have a slow rate of water transmission.
- Group D soils have the slowest infiltration rates and a high runoff potential. These soils are typically clay and exhibit very very slow rates of water transmission.

- Dual hydrologic groups (A/D, B/D, and C/D) are classified differently. The first letter represents the HSGs for the artificially drained soils in the area. The second letter represents the HSGs for the undrained, natural conditions. Only soils that are rate D in the natural conditions are assigned to dual classes.

The location of Group A and Group B soils within a watershed is imperative to a watershed planning process. Many of the BMPs included in watershed plans are infiltration BMPs including rain gardens, bioswales, and infiltration basins. Table 3-6 summarizes the HSGs and their corresponding attributes. Figure 3-9 depicts the location of each HSG within the watershed while Table 3-7 summarizes the acreage and percent of each subwatershed for each HSG. In summary, 93.28% of the soils in the East Branch of the South Branch Kishwaukee River watershed as Group B with 4.37% classified as Group B/D. The remaining 2.35% of soils are comprised of Group A, C, C/D, and unclassified soils. There are no Group A or D soils in the East Branch of the South Branch Kishwaukee River watershed.

Table 3-6 Hydrologic Soil Groups and their corresponding attributes in the East Branch South Branch Kishwaukee River Creek watershed

HSG	Soil Texture	Drainage Description	Runoff Potential	Infiltration Rate	Transmission Rate
A	Sand, loamy sand, or sandy loam	Well to excessively well drained	Low	High	High
A/D	Sand or silt loam to clay	Well drained to poorly drained	High to Low	High to Very Low	High to Very Low
B	Silt loam or loam	Moderately well to well drained	Moderate	Moderate	Moderate
B/D	Silt loam, silty clay loam, clay	Moderately well to poorly drained	Moderate to Low	Moderate to Low	Moderate to Very Low
C	Sandy clay loam	Somewhat poorly drained	High	Low	Low
C/D	Sandy clay loam, silty clay loam, clay	Somewhat poorly drained to poorly drained	High	Low to Very Low	Low to Very Low
D	Clay loam, silty clay loam, sandy clay loam, silty clay, clay	Poorly drained	High	Very Low	Very Low

Table 3-7 Hydrologic Soil Groups including acreage and percent of subwatershed

HSG	Total Acreage	Percent of Watershed
East Branch South Branch Kishwaukee River Subwatershed		
A	0	0.00%
A/D	24.37	0.10%
B	15516.97	64.06%
B/D	8262.69	34.11%
C	54.07	0.22%
C/D	90.81	0.37%
D	0	0.00%
Unclassified	275.02	1.14%

HSG	Total Acreage	Percent of Watershed
Union Ditch Subwatershed		
A	0	0.00%
A/D	669.86	1.80%
B	22081.91	59.34%
B/D	13716.70	36.86%
C	351.97	0.95%
C/D	322.68	0.87%
D	0	0.00%
Unclassified	67.99	0.18%
Virgil Ditch Subwatershed		
A	2.06	0.01%
A/D	112.50	0.65%
B	9688.50	55.81%
B/D	7159.08	41.24%
C	244.60	1.41%
C/D	137.50	0.79%
D	0	0.00%
Unclassified	14.51	0.08%

As noted above, East Branch of the South Branch Kishwaukee River watershed is comprised mainly of Type B and B/D soils. Type B soils are soils with moderately low runoff potential when thoroughly wet. Water is typically transmitted through these soils without impediment. Type B soils typically have less than 20 percent clay, and between 50 and 90 percent loamy sand or sandy loam textures. These soils have moderately fine to moderately course textures. Type B/D soils are soils with a water table within 24 inches of the surface. When adequately drained, Type B/D soils exhibit properties of Type B soils. In undrained conditions, Type B/D soils exhibit the properties of Type D soil. Type D soils have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Type D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. The predominance of these Type B and B/D soils (when drained) in the East Branch of the South Branch Kishwaukee River watershed should facilitate infiltration in pervious areas.

3.7 Watershed Jurisdictions

Two counties, eight municipalities and eleven townships comprise the East Branch South Branch Kishwaukee River watershed (Table 3-8, Figure 3-10). Additional entities with jurisdiction in the watershed include:

1. DeKalb County Soil and Water Conservation District
2. Kane/DuPage County Soil and Water Conservation District
3. DeKalb County Board Districts (District 1, 3, 4, 8, 9, 10, and 11)
4. Kane County Board Districts (District 15, 25, and 26)
5. Illinois State Representative District (Districts 50, 65, 70, and 90)
6. Illinois State Senatorial District (Districts 25, 33, 35, and 45)
7. US Congressional District (Districts 14 and 15)

Table 3-8 County, municipal, and township jurisdictions in the East Branch of the South Branch Kishwaukee River Watershed

Jurisdiction	Square Miles in E Branch S Branch Kishwaukee River subwatershed	Square Miles in Union Ditch subwatershed	Square Miles in Virgil Ditch Subwatershed	Total Square Miles in Watershed	Percent of Watershed
Counties					
DeKalb	37.83	21.98	0.59	60.40	49.1%
Kane	0.02	36.16	26.54	62.72	50.9%
Municipalities					
Burlington	0.00	0.00	1.73	1.73	1.41%
Campton Hills	0.00	1.39	0.07	1.46	1.19%
Cortland	1.95	1.58	0.00	3.53	2.87%
Elburn	0.00	0.04	0.00	0.04	0.03%
Lily Lake	0.00	1.30	0.00	1.30	1.06%
Maple Park	0.00	2.25	0.00	2.25	1.83%
Sycamore	8.56	0.00	0.00	8.56	6.95%
Virgil	0.00	1.69	0.44	2.13	1.73%
Townships					
Afton	0.00	1.17	0.00	1.17	0.95%
Burlington	0.02	0.32	16.89	17.23	13.99%
Campton	0.00	7.30	0.00	7.30	5.93%
Cortland	17.41	16.12	0.07	33.59	27.29%
DeKalb	0.00	1.10	0.00	1.10	0.90%
Kaneville	0.00	0.32	0.00	0.32	0.26%
Mayfield	0.78	0.00	0.00	0.78	0.63%
Pierce	0.00	3.57	0.00	3.57	2.90%
Plato	0.00	1.90	1.60	3.51	2.85%
Sycamore	19.64	0.01	0.52	20.17	16.39%
Virgil	0.00	26.32	8.05	34.36	27.91%
Soil and Water Conservation Districts					
DeKalb	37.83	21.98	0.59	60.40	49.1%
Kane/DuPage	0.02	36.16	26.54	62.72	50.9%
Drainage Districts					
Burlington #1	not available	not available	not available	not available	not available
Burlington #2	not available	not available	not available	not available	not available
Afton DeKalb	0.00	0.32	0.00	0.32	0.26%
Coon Creek Drainage	0.03	0.00	0.11	0.14	0.11%
Cortland Pierce Drainage #16	1.85	10.26	0.00	12.11	9.84%
Union Drainage	0.00	14.86	0.36	15.22	12.36%
Virgil Courtland Drainage #15	2.57	6.41	0.00	8.98	7.29%
Virgil #1	not available	not available	not available	not available	not available
Virgil #2	not available	not available	not available	not available	not available
Virgil #3	not available	not available	not available	not available	not available

Jurisdiction	Square Miles in E Branch S Branch Kishwaukee River subwatershed	Square Miles in Union Ditch subwatershed	Square Miles in Virgil Ditch Subwatershed	Total Square Miles in Watershed	Percent of Watershed
DeKalb County Board Districts					
01	1.46	0.00	0.00	1.46	1.19%
03	28.35	4.77	0.58	33.70	27.37%
04	5.00	0.00	0.00	5.00	4.06%
08	1.93	0.00	0.00	1.93	1.57%
09	0.00	0.05	0.00	0.05	0.04%
10	0.63	3.58	0.00	4.21	3.42%
11	0.45	13.56	0.00	14.01	11.38%
Kane County Board Districts					
15	0.00	4.53	0.00	4.53	3.68%
25	0.02	24.86	26.54	51.42	41.77%
26	0.00	6.77	0.00	6.77	5.50%
Illinois General Assembly Districts					
50	0.00	2.81	0.00	2.81	2.29%
65	0.00	0.00	0.14	0.14	0.12%
70	37.85	53.58	26.98	118.41	96.18%
90	0.00	1.75	0.00	1.75	1.42%
Illinois Senate Districts					
25	0.00	2.81	0.00	2.81	2.29%
33	0.00	0.00	0.14	0.14	0.12%
35	37.85	53.58	26.98	118.41	96.18%
45	0.00	1.75	0.00	1.75	1.42%
US House of Representative Districts					
1714	32.41	55.88	27.12	115.41	93.75%
1716	5.71	2.26	0.00	7.97	6.25%

One Watershed: Multiple Decision Makers

As watershed boundaries do not typically follow political boundaries, one of the greatest challenges faced during watershed planning and implementing a watershed plan is that watersheds typically include multiple jurisdictions that have varying interests, resources, and responsibilities. Actions by one jurisdiction in the watershed impact others in watershed both negatively and positively. By actively working together, jurisdictions within the watershed can ensure that that goals, objectives, and projects outlined in the watershed plan are considered in each of the jurisdiction's decision making process on policies, projects, and programs.

As part of the watershed planning process, the DeKalb County Watershed Steering Committee was formed. The DeKalb County Watershed Steering Committee has been successful in bringing together representatives from the counties, municipalities, townships, Drainage Districts, and SWCDs. Additionally, the DeKalb County Watershed Steering Committee includes watershed residents. Ensuring that the DeKalb County Watershed Steering Committee or a similar watershed council continues to be active after the watershed planning process is complete is a necessity to provide a venue for communication, coordination, and collaboration between the multiple watershed jurisdictions and ensure the implementation of the watershed plan.

Key stakeholders in the watershed are listed in Table 3-9. A brief description of each stakeholder's role in watershed-plan implementation is also included.

Table 3-9 Key Watershed Stakeholders

Watershed Stakeholders	Abbreviation
Corporate and Business Landowners	CBL
Counties	C
DeKalb County Community Foundation	DCCF
DeKalb County Forest Preserve	DCFP
DeKalb County Stormwater Management Committee	DCSMPC
DeKalb County Watershed Steering Committee	DCWSC
Developers and Builders	DB
Drainage Districts	DD
Educational Institutions	EI
Federal Emergency Management Agency	FEMA
Forest Preserve District of Kane County	FPDKC
Golf Courses	GC
Illinois Department of Natural Resources	IDNR
Illinois Department of Transportation	IDOT
Illinois Emergency Management Agency	IEMA
Illinois Environmental Protection Agency	Illinois EPA
Kishwaukee Ecosystem Partnership	KREP
Municipalities	MUN
Park Districts	PD
Residents/Owners	RO
Soil Water Conservation Districts	SWCD
US Army Corps of Engineers	USACE
US Department of Agriculture	USDA
US Environmental Protection Agency	US EPA
US Fish and Wildlife Service	US FWS

Corporate and Business Landowners (CBL)

The active participation of CBLs in the planning process can lead to positive impacts on the quality of the East Branch South Branch Kishwaukee Creek Watershed. Businesses and commercial properties can become involved by retrofitting existing detention basins and swales, managing their grounds, roof runoff, and parking lots to reduce stormwater runoff volume and pollutant loadings, and sponsoring watershed events. Coordination with the CBL community can also lead to new development designed to minimize runoff and pollutant loadings.

Counties (C) including DeKalb and Kane

The Counties are responsible for land use planning, development, natural resource protection, and drainage system management in the unincorporated areas of the East Branch South Branch Kishwaukee Creek Watershed. Working with the Counties and their public works, development, water resources, health, and transportation departments, can help ensure responsible, sustainable land use planning, road and sewer maintenance, and public health policies for the watershed.

DeKalb County Community Foundation (DCCF)

The DeKalb County Community Foundation is committed to providing tools and resources to enhance land use planning within the County through a watershed-based approach and provided the local cash match for the watershed-based planning grant. DCCF holds a position on the DeKalb County Watershed Steering Committee. The DCCF Land Use Committee composed of DCCF board members and community stakeholders, prioritizes and funds eligible projects to implement and enhance the County's watershed-based plan and supports watershed planning opportunities for the balance of the County.

DeKalb County Forest Preserve (DCFP)

The DeKalb County Forest Preserve District carries out a broad range of ecological restoration and maintenance activities intended to address our core mission: acquire lands to "preserve, protect and restore the flora, fauna and natural beauties, as near as may be, in their natural state and condition, for the education and recreation of our citizens". The DeKalb County Forest Preserve District manages 16 preserves with woodlands, prairies, wetlands and waterways and within the East Branch South Branch Kishwaukee River watershed the Forest Preserve maintains the Great Western Trail.

DeKalb County Stormwater Management Committee (DCSWMPC)

The DeKalb County Stormwater Management Planning Committee is responsible for the creation for the County-wide Stormwater Management Plan and Ordinance. The Committee provides direction for the Plan's implementation and coordinates the County-wide Stormwater Management Ordinance with the municipalities within the boundaries of the County. The Committee monitors and evaluates the implementation of the County-wide Stormwater Management Plan and Ordinance, and recommends updates and amendments when deemed necessary or appropriate.

DeKalb County Watershed Steering Committee (DCWSC)

The DeKalb County Watershed Steering Committee (DCWSC) is a consortium of municipalities in the watershed, resource agency professionals, environmental advocates, and local residents that established itself to guide the development of strategies to protect and restore the East Branch South Branch Kishwaukee River and its tributaries. It is likely that DCWSC will be the primary lead for the implementation of the watershed-based plan.

Developers & Builders (DB)

As discussed previously in the watershed-based plan, the design and construction of properties can significantly impact a watershed. Developers should be encouraged or required to utilize development techniques that protect water quality and stream health. Builders should properly install and maintain BMPs during the construction phase in order to reduce the potential for sediment-bearing water to be discharged to creek and natural areas.

Drainage Districts (DD)

Drainage districts are local bodies formed for the purpose of draining, ditching, and improving land for agricultural and sanitary purposes.

Educational Institutions (EI)
There are numerous educational institutions such has Sycamore High School and Northern Illinois University located within and near the watershed that can have an integral role in implementing the watershed plan. These educational institutions have expertise in water quality monitoring and environmental education that can be used to support watershed protection and improvement initiatives.

Federal Emergency Management Agency (FEMA)
FEMA is the principal federal agency involved in flood mitigation and flood disaster response. FEMA is responsible for the National Flood Insurance Program, helps municipalities develop and enforce floodplain ordinances, develops floodplain maps, and administers funding for flood mitigation plans and projects.

Forest Preserve District of Kane County (FPDKC)
The Forest Preserve District of Kane County owns and manages a number of acres of open space within the East Branch South Branch Kishwaukee River Watershed. Issues related to the protection and management of these and potential future FPD holdings will rely in part on the FPDKC.

Golf Courses (GC)
Golf courses can help reduce pollutant loadings, especially nutrients, as well as runoff volume by incorporating BMPs into their golf course management programs.

Illinois Department of Natural Resources (IDNR)
Several offices within IDNR provide services that will be key to the implementation of the East Branch South Branch Kishwaukee Creek Watershed Plan for issues related to water resource management, habitat protection and management, wildlife management, invasive species control, and wetland management.

- The Office of Water Resources (OWR) is responsible for the regulation of floodplain development as well as for the implementation and funding of structural flood control and mitigation.
- The Office of Realty and Environmental Planning (OREP) is responsible for natural resource and outdoor recreation planning. It also administers the Conservation 2000 Ecosystems Program, which provides technical and financial assistance through a grant program for natural resource protection.
- The Office of Resource Conservation (ORC) reviews Clean Water Act Section 404 wetland permits for impacts on fish and wildlife resources; it manages threatened and endangered species issues; it also protects fisheries and other aquatic resources through regulation, ecological management and public education.

Illinois Department of Transportation (IDOT)
IDOT Region 3 is responsible for the planning, construction, and maintenance of portions of the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into IDOT projects can help lead to improvements in the environmental quality of the watershed.

Illinois Emergency Management Agency (IEMA)
IEMA is responsible for flood and disaster planning, emergency response, and hazard mitigation. IEMA works with local governments on flood mitigation plans and provides operational support during floods. IEMA also administers FEMA-funded programs in the state, including flood mitigation grant programs.

Illinois Environmental Protection Agency (Illinois EPA) Bureau of Water
The Illinois EPA is responsible for the protection of the state's water resources and ensuring that Illinois' rivers, streams and lakes will support all uses for which they are designated including protection of aquatic life, recreation and drinking water supplies. The Illinois EPA also provides technical assistance and administers several state and federal grant programs, including Section 319 funding, which helps local governments, not-for-profits, and other stakeholders to complete projects that are aimed at reducing nonpoint source pollution.

Kane County Division of Transportation (KCDOT)
KDOT is responsible for the planning, construction, and maintenance of county highways located in the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into KDOT projects can help lead to improvements in the environmental quality of the watershed.

Kishwaukee River Ecosystem Partnership (KREP)
The Kishwaukee River Ecosystem Partnership is a group of open space agencies, conservation organizations and local governments in the Kishwaukee River watershed organized under the auspices of the Illinois Department of Natural Resources to protect and restore the high water quality and habitat values of the river and its tributary streams.

Municipalities (all departments) (MUN)
Municipalities (i.e., local elected officials and local agency staff) have the principal responsibility for land use and development planning, establishing legislative and administrative policies, adopting ordinances and resolutions, setting zoning standards, establishing the annual budget, appropriating funds, and setting tax rates. Municipalities are a critical stakeholder in watershed protection efforts because they are responsible for the enforcement of local land use and development ordinances.

Parks Districts (PD)
Park Districts maintain numerous recreational facilities and parks in the watershed. Partnerships with local park districts can help ensure the preservation of open space while also facilitating recreational and other community opportunities that can help increase support for watershed protection efforts.

Residents and Owners (RO)
The activities of residential landowners, often unknowingly, can have a significant impact of the quality of a watershed. Practices such as excessive lawn fertilization application, disposal of trash and yard waste in waterways or encroachment riparian buffers can be significant sources of nonpoint pollution. Recommendations of the watershed-based plan should include education and outreach programs aimed at informing residents about potential consequences of their actions and presenting alternative actions. Additionally, political

pressure from local residents on municipal, township, state and federalcounty officials can lead to increased efforts focused on water quality protection and flood remediation.

Townships (TOWN)
While unincorporated townships generally play a secondary role in watershed protection, they often have responsibility for road upkeep and occasionally sponsor drainage system improvement projects. The use of BMPs by townships, especially for road maintenance, can help improve water quality and stream habitat within the watershed.

Soil and Water Conservation Districts (SWCD) including DeKalb and Kane/DuPage
Soil & Water Conservation Districts are locally operated units of government functioning under Illinois law. The SWCD's mission is to promote the protection, restoration, and wise use of the soil, water, and related resources within the district. They provide technical and educational resources in the areas of soils and land use, water quality, soil erosion in both urban and agricultural land uses, conservation program needs, wildlife habitat, and native ecosystem restoration and management.

U.S. Army Corps of Engineers (USACE)
USACE plays a major role in wetland protection and regulation through Section 404 of the Clean Water Act, which requires USACE to administer permit applications for alterations to wetlands that are considered Waters of the United States.

U.S. Department of Agriculture (USDA)
USDA's Farm Services Agency (FSA) has several programs that support watershed protection and restoration efforts. Under the Conservation Reserve Program (CRP), farmers receive annual rental payments, cost sharing, and technical assistance to plant vegetation for land they put into reserve for 10 to 15 years. The Conservation Reserve Enhancement Program (CREP) targets state and federal funds to achieve shared environmental goals of national and state significance. The program uses financial incentives to encourage farmers and ranchers to voluntarily protect soil, water, and wildlife resources. The Grassland Reserve Program (GRP) uses 30-year easements and rental agreements to improve management of, restore, or conserve up to 2 million acres of private grasslands. The USDA Natural Resource Conservation Service (NRCS) Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on tribal and private working lands. The USDA NRCS Environmental Quality Improvement Program (EQIP) provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.

U.S. Environmental Protection Agency (USEPA)
The USEPA oversees the environmental protection efforts of the Illinois EPA and is the ultimate source for Section 319 and other environmental improvement programs. Section 404 of the Clean Water Act, which regulates the dredging and filling of wetlands, is jointly administered by USEPA and the US Army Corps of Engineers.

U.S. Fish and Wildlife Service (USFWS)
The USFWS provides technical assistance to local watershed protection groups. It also administers several grant and cost-share programs that fund wetland and aquatic habitat restoration. The USFWS also administers the federal Endangered Species Act and supports a program called Endangered Species Program Partners, which features formal or informal partnerships for protecting endangered and threatened species and helping them to recover. These partnerships include federal partners as well as states, tribes, local governments, nonprofit organizations, and individual landowners.

3.8 Watershed Demographics

The Chicago Metropolitan Agency for Planning (CMAP), formerly known as the Northeastern Illinois Planning Commission (NIPC) and Chicago Area Transportation Study (CATS), provides a 2040 regional framework plan for the greater Chicagoland Area including Kane County. The *Go To 2040* regional framework plan focuses on centers, corridors, and green areas to establish a framework for the region's communities to plan more effectively to deal with growth forecasts. CMAP's 2010 to 2040 forecasts of population, households, and employment for Kane County and Kane County municipalities was used to project how these attributes will affect the Kane County portion of the East Branch South Branch River watershed (Table 3-10).

Information on 2010 population, households, and employment for DeKalb County and DeKalb County municipalities was obtained from the US Census Bureau (Table 1-10). Future forecast on population for DeKalb County for 2030 was obtained from the Illinois Department of Commerce and Economic Opportunity. Additional demographics were not readily available for DeKalb County. A request for forecasts on population, households, and employment was submitted to the Northern Illinois University (NIU) Center for Governmental Studies but was not yet available at the time of this report.

Table 3-10 2010 and 2040 Forecast Data for the Kane and DeKalb Counties

County	Population		Households		Employment	
	2010	2030/2040	2010	2040	2010	2040
DeKalb	105,610	124,200	38,484	not available	58,734	not available
Kane	532,852	802,231	179,702	274,085	224,546	368,494

Information from CMAP's *Go To 2040* forecast was also used to summarize population, households, and employment for Kane County municipalities with borders in the East Branch South Branch Kishwaukee River watershed. Additionally, information from the US Census was used to summarize 2010 population, households, and employment for the DeKalb County municipalities within the watershed. Additionally 2020 population forecasts were obtained from the Illinois Department of Commerce and Economic Opportunity for the DeKalb County municipalities. It is important to note that many of these watersheds have boundaries that extend beyond the watershed; therefore, the information in Table 3-11 is for the entire municipality, not just those areas contained within the watershed. Municipal data indicates significant population and household growth projected for Burlington, Campton Hills, Elburn, and Virgil. Employment is also expected to significantly increase in

Burlington and Elburn. This growth will likely have a significant effect on land use and watershed conditions in the northeastern and eastern portion of the watershed.

Table 3-11 2010 and 2040 Forecast Data for Each Municipality in the Watershed

County	Population		Households		Employment	
	2010	2020/2040	2010	2040	2010	2040
Burlington	2,051	5,049	729	1,796	260	1,200
Campton Hills	13,763	18,006	4,242	5,657	1,208	1,209
Cortland	4,270	17,220	1,423	not available	not available	not available
Elburn	5,729	12,260	2,014	4,471	1,801	3,106
Lily Lake	1,055	1,265	351	401	214	257
Maple Park	979	1,492	343	515	42	248
Sycamore	20,006	not available	6,993	not available	not available	not available
Virgil	975	2,362	353	825	145	198

Table 3-12 includes 2010 population, households, and employment forecast for the East Branch South Branch Kishwaukee watershed only. This data was generated by Township, Range, and quarter Sections. If any part of a quarter section was located within the watershed boundary, the statistics for the entire quarter section were included in the calculations. Therefore, the numbers in Table 3-12 are overstated.

Table 3-12 2010 Data for the East Branch South Branch Kishwaukee River Watershed

Data Category	2010
Population	30,648
Households	12,163
Employment	41,466

Information on median age and median income of the watershed's counties and municipalities was obtained from Cubit Planning via Illinois-demographics.com and is displayed in Table 3-13. The median age and median income data was compiled using information obtained from the 2010 Census Data and American Communities Survey Data.

Table 3-13 Median Age and Income by Jurisdiction

Jurisdiction	Median Age (2010)	Median Income (2010)
Counties		
Kane	34.5	$67,767
DeKalb	29.3	$54,002
Municipalities		
Burlington	40.3	$59,010
Campton Hills	42.4	$135,385
Cortland	29.5	$65,868
Elburn	35.1	$91,950
Lily Lake	40.3	$95,000
Maple Park	35.9	$62,059
Sycamore	34.8	$66,359
Virgil	36.5	$71, 875

1.9 Land Use

Land use and cover refer to the type of use assigned to a parcel, such as residential or commercial, and the type of surface coverage found on a parcel, such as forest and grassland, respectively. This information is necessary for understanding the impact of current and future land use on watershed resources and the restoration potential.

1.9.1 Historical Land Use

1972 Land Use data for the East Branch South Branch Kishwaukee River watershed was obtained from the United States Geological Survey (USGS) GIRAS Land Use and Land Cover database. USGS GIRAS Land Use and Land Cover for the East Branch South Branch Kishwaukee River watershed is summarized in Table 3-14 and depicted in Figure 3-11.

Table 3-14 Geological Survey (USGS) GIRAS Land Use and Land Cover for the East Branch South Branch Kishwaukee River Watershed

USGS GIRAS Land Use and Land Cover Type	Acres	Percent of Watershed
Commercial and Services	621.62	0.79%
Combined Animal Feeding Operations	166.82	0.21%
Cropland and Pasture	74765.51	94.89%
Deciduous Forest Lands	411.23	0.52%
Evergreen Forest Land	101.42	0.13%
Industrial	177.22	0.22%
Mixed Urban or Built-Up Land	95.86	0.12%
Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticulture	77.24	0.10%
Other Agricultural Lands	44.60	0.06%
Other Urban or Built-Up Land	225.86	0.29%
Reservoirs	89.10	0.11%
Residential	1449.53	1.84%
Strip Mines	160.94	0.20%
Transportation, Communication and Utilities	180.95	0.23%
Transitional Areas	225.90	0.29%

Definitions of each land use/cover types listed in Figure 3-11 and Table 3-14 are as follows:

Commercial and Services: Land cover that contains commercial areas used predominately for the sale of products and services. Includes such land uses as urban business districts, shopping centers, commercial strip developments, junkyards, resorts, etc. Institutional land uses such as educational, religious, health, correctional and military facilities are also included in this land use.

Combined Animal Feeding Operations: Land cover than contains areas used predominately for specialized livestock production including beef cattle feedlots, dairy operations with confined feeding, large poultry farms, and hog feedlots.

Cropland and Pasture: Land cover consisting of agricultural land used for harvest and pasture.

Deciduous Forest Lands: Land cover consisting of all forested areas having a predominance of trees that lose their leaves at the beginning of the forest system or at the beginning of a dry season.

Evergreen Forest Lands: Land cover consisting of all forested areas dominated by trees where 75 percent or more of the tree species `maintain their leaves all year. Canopy is never without green foliage.

Industrial: Land cover that contains commercial areas used predominately for the manufacturing, production, and warehousing of goods.

Mixed Urban or Built-Up Land: Land cover that contains commercial areas where one third of the land area is comprised of a non-commercial use such as residential or institutional. These areas are typically downtown business districts.

Orchards, Groves, Vineyards, Nurseries, and Ornamental Horticulture: Land cover consisting of all areas utilized as orchards and groves that produce fruit and nut crops and nurseries and horticulture areas such as seed-and-sod areas, greenhouses, and floriculture.

Other Agricultural Land: Land cover of other agricultural land uses not included in confined feeding operations, crop and pasture lands, and orchards, vineyards, nurseries, and horticulture. These typically include farmsteads, holding areas for livestock, breeding and training facilities on horse farms, and similar uses.

Other Urban or Built-Up Land: Land cover consisting of golf driving ranges, zoos, urban parks, cemeteries, waste sumps, water-control structures and spillways, golf courses, and ski areas.

Reservoirs: Land cover that contains artificial impoundments of water used for irrigation, flood control, municipal water supplies, hydroelectricity, recreation, and similar uses.

Residential: Land cover than contains residential areas ranging from high density to low density.

Strip Mines: Land cover consisting of extractive mining activities with a significant surface expression.

Transportation, Communications and Utilities: Land cover that includes roads, railways, airports, seaports, and major lake ports.

Transitional Areas: Land cover in areas that are in transition from one land use activity to another.

3.9.2 Existing Land Use

2005 Land Use data for Kane County was obtained from the Chicago Metropolitan Agency for Planning (CMAP). DeKalb County provided Land Use data for the DeKalb County portion of the watershed. However, the land use provided by DeKalb County did not cover the entire watershed area. For areas where land use data was not available, aerial photography, zoning information and field inspections was used to generate existing land use. Existing Land Use and Land Cover for the East Branch South Branch Kishwaukee River watershed is summarized in Table 3-15 and depicted in Figure 3-12.

Table 3-15 Existing Land Use for the East Branch South Branch Kishwaukee River Watershed

Land Use	Acres	Percent of Watershed
Agricultural	66455.72	84.34%
Forest and Grassland	1862.23	2.36%
Government, Civic and Institutional	500.86	0.64%
Industrial	708.69	0.90%
Mixed Use	52.29	0.07%
Multifamily Residential	318.28	0.40%
Office Space	83.22	0.11%
Open Space/Conservation/Parks	1542.40	1.96%
Retail/Commercial	186.97	0.24%
Single-family Residential	3001.08	3.81%
Transportation	4046.68	5.14%
Utility/Waste Facility	35.37	0.04%

Definitions of each land use/cover types listed in Figure 3-12 and Table 3-15 are as follows:

Agriculture: Land cover consisting of agricultural land used for harvest and pasture.

Forest and Grasslands: Land cover consisting of primarily natural areas for passive recreational use. Includes such land uses as forest preserves and conservation easements.

Government, Civic and Institutional: Land cover consisting of large institutional structures such as schools and governmental administration buildings.

Industrial: Land cover consisting of manufacturing and processing, warehousing and distribution centers, wholesale facilities, and industrial parks.

Mixed Use: Land cover where various types residential and commercial land uses are grouped or clustered together as a planned development.

Multifamily Residential: Land cover that contains multi-family and duplex residential properties of varying density.

Office Space: Land cover where the primary usage of structures is for office space and limited or no retail sales occur.

Open Space/Conservation/Parks: Land cover consisting of parks, golf courses, nature preserves, playgrounds and athletic fields when associated with another open space activity. Also included in this category are wetlands, open water and riparian corridors.

Retail/Commercial: Land cover that contains commercial areas used predominately for the sale of products and services. Includes such land uses as urban business districts, shopping centers, commercial strip developments, etc.

Single Family Residential: Land cover that contains single family residential properties of varying densities.

Transportation: Land cover that includes roads, railways, airports, seaports, and major lake ports.

Utility/Waste Facility: Land use consists of facilities whose primary function is for the support of large scale infrastructure or processing of public wastes. This includes items such as natural gas or electric distribution sub-stations, telecommunications structures, wastewater treatment facilities and water distribution facilities.

3.9.3 Future Land Use/Land Cover Projections

Information on future built out lands for the Kane County portion of the watershed was obtained from Kane County. DeKalb County provided future land use data for the DeKalb County portion of the watershed. Additionally, future land use plans were obtained from Burlington, Campton Hills, Cortland, DeKalb, Maple Park, Sycamore, and Virgil and was used to develop the future land use information for areas not covered by Kane and DeKalb Counties. The data was analyzed and GIS used to map the land use/land cover based on an approximate 2030-2040 projection. Future Land Use and Land Cover for the East Branch South Branch Kishwaukee River watershed is summarized in Table 3-16 and depicted in Figure 3-13.

Table 3-16 also compares the existing land use/land cover to future land use/land cover projections. The most obvious change occurs with agriculture (loss of 22,471.1 acres). This decrease is the result of development including single family residential (additional 3,789.56 acres) mixed use (additional 3,467.99 acres), multifamily residential (additional 3,468.26 acres), and retail/commercial (additional 1,482.65 acres). Much of the development change is predicted to occur in the western and eastern portion of the watershed near the Campton Hills, Cortland, Elburn, Maple Park and Sycamore.

Table 3-16 Projected Land Use for the East Branch South Branch Kishwaukee River Watershed

Land Use	Current Area (acres)	Current % of Watershed	Projected Area (acres)	Projected % of Watershed	Change (acres)	Change (%)
Agricultural	66455.72	84.34%	43984.67	55.82%	-22471.05	-28.52%
Conservation Neighborhood	0.00	0.00%	2968.18	3.77%	2968.18	3.77%
Forest and Grassland	1862.23	2.36%	498.83	0.63%	-1363.4	-1.73%
Government, Civic and Institutional	500.86	0.64%	565.98	0.72%	65.12	0.08%
Industrial	708.69	0.90%	3520.28	4.47%	2811.59	3.57%
Mixed Residential	0	0.00%	3786.54	4.81%	3786.54	4.81%
Mixed Use	52.29	0.07%	657.48	0.83%	605.19	0.76%
Multifamily Residential	318.28	0.40%	314.4	0.40%	-3.88	0.00%
Office Space	83.22	0.11%	1669.62	2.12%	1586.4	2.01%
Open Space/Conservation/Parks	1542.4	1.96%	6799.63	8.63%	5257.23	6.67%
Retail/Commercial	186.97	0.24%	1466.02	1.86%	1279.05	1.62%

Land Use	**Current Area (acres)**	**Current % of Watershed**	**Projected Area (acres)**	**Projected % of Watershed**	**Change (acres)**	**Change (%)**
Single-family Residential	3001.08	3.81%	8750.6	11.11%	5749.52	7.30%
Transportation	4046.68	5.14%	3811.26	4.84%	-235.42	-0.30%
Utility/Waste Facility	35.37	0.04%	0.31	0.00%	-35.06	-0.04%

Definitions of each land use/cover types listed in Figure 3-13 and Table 3-16 are as follows:

Agriculture: Land cover consisting of agricultural land used for harvest and pasture.

Conservation Development: Land cover consisting that adopts the principle for allowing limited sustainable development while protecting the area's natural environmental features by preserving open space, farmland or natural habitats for wildlife and maintaining the character of rural communities

Forest and Grasslands: Land cover consisting of primarily natural areas for passive recreational use. Includes such land uses as forest preserves and conservation easements.

Government, Civic and Institutional: Land cover consisting of large institutional structures such as schools and governmental administration buildings.

Industrial: Land cover consisting of manufacturing and processing, warehousing and distribution centers, wholesale facilities, and industrial parks.

Mixed Residential: Land cover consisting of various types of residential land uses are grouped or clustered together.

Mixed Use: Land cover where various types of the residential and commercial land uses are grouped or clustered together as a planned development.

Multifamily Residential: Land cover that contains multi-family and duplex residential properties of varying density.

Office Space: Land cover where the primary usage of structures is for office space and limited or no retail sales occur.

Open Space/Conservation/Parks: Land cover consisting of parks, golf courses, nature preserves, playgrounds and athletic fields when associated with another open space activity. Also included in this category are wetlands, open water and riparian corridors.

Retail/Commercial: Land cover that contains commercial areas used predominately for the sale of products and services. Includes such land uses as urban business districts, shopping centers, commercial strip developments, etc.

Single Family Residential: Land cover that contains single family residential properties of varying densities.

Transportation: Land cover that includes roads, railways, airports, seaports, and major lake ports.

Utility/Waste Facility: Land use consists of facilities whose primary function is for the support of large scale infrastructure or processing of public wastes. This includes items such as natural gas or electric distribution sub-stations, telecommunications structures, wastewater treatment facilities and water distribution facilities.

3.9.4 Land Use Impacts on the Watershed

The conversion of agricultural lands to residential and retail/commercial land uses increases the amount of impervious cover for a given area and reduces the amount of open space available for infiltrating and storing storm water runoff. Imperviousness is generally defined as the sum of roads, parking lots, sidewalks, rooftops, and other surfaces within an urban landscape that prevent infiltration of storm water runoff. Imperviousness can be used to measure the impacts of urban land uses on aquatic systems. For example, an increase in imperviousness has negative implications on the natural functions of streams including water quality; hydrology and flows; flooding and depressional storage; and instream and riparian habitat.

Water Quality

Increases in impervious area negatively affects water quality in streams and lakes by increasing pollutant loads and water temperature. During dry conditions, impervious areas accumulate pollutants including nutrients, sediment, oils, bacteria, and metals from the atmosphere, vehicles, roof surfaces, lawns, and other sources. During storm events, these pollutants are washed from the impervious surface and delivered to streams and lakes. Additionally, runoff from impervious surfaces is typically 12 degrees (Fahrenheit) higher in temperature than runoff from vegetated areas. Water temperatures over 68°F may preclude most fish from using the streams for habitat.

Hydrology and Flows

Hydromodification is a term that is used to describe human induced activities that change the dynamics of surface or subsurface flow. The process of urbanization affects streams by altering watershed hydrology and sediment-transport patterns. Development increases the amount of impervious surfaces (parking lots, rooftops, highly compacted ground, etc) on formerly undeveloped landscapes. This reduces the capacity of the remaining pervious surfaces to capture, filter rainfall, and allow the rainfall to infiltrate into the ground. As a result, a larger percentage of rainfall becomes runoff during any given storm. Subsequently, runoff reaches stream channels much more quickly, and peak discharge rates are higher than before development for the same size rainfall event.

Flooding and Depressional Storage

Flooding is also a consequence of increased stream flows that can result from increased impervious cover. As discussed above, increased flows lead to hydromodification. The short-term impact result of hydromodification is localized, overbank flooding. Over the long term, hydromodification will cause the stream channel to expand as a means of handling the higher flows. As the stream channel expands, the banks will erode and the bottom will become deeper. This deepening of the stream channel is called incision. Channel incision leads to a disconnect between the stream and its floodplain. Once separated, high flows that were once stored in the floodplain and wetlands and slowly released back into the stream are forced to remain in the channel. These "trapped" flows have high velocities leading to additional streambank erosion and incision of the stream channel. It becomes a vicious pattern where with each rainfall event; the creek continues to erode adding additional sediments to the watershed and further preventing the creek to access the floodplain.

Habitat
Increased impervious cover negatively impacts stream habitat and its associated biological communities (fish, macroinvertebrates, amphibians, etc). As discussed above, as hydromodification occurs streambanks and stream bottoms will begin to erode. The process of stream bank erosion and channel incision causes a significant amount of sediment to be generated within the stream and carried through the watershed and into the stream's receiving water. The sediment suspended in the water causes turbid conditions that can be detrimental to aquatic organisms. Additionally, as this sediment falls out of the water column, the deposited sediment can also negatively affect aquatic organisms by filling interstitial spaces in substrates that are necessary for macroinvertebrate and fish propagation and life. Physical habitat degradation can also occur when hydromodification causes loss of riffle-pool structures and loss of riparian cover.

3.9.5 Impervious Area Analysis

As discussed above in Section 3.9.4, impervious area can be used to qualitatively measure the impacts of urban land uses on aquatic systems. Studies on impervious areas have indicated that stream health begins to degrade when the watershed reaches approximately 10% impervious cover. The Impervious Area Analysis utilized is based on the belief that as the percentage of watershed imperviousness increases with increasing urbanization, the quality of physical, chemical, and biological conditions of streams within the watershed decreases.

The Impervious Area Analysis was used to help understand how stream quality relates to the subwatershed area that drains to a particular stream reach. This analysis uses the subbasins described in Section 3.13.2 and illustrated in Figures 3-23 to 3-25. Impervious cover was calculated by assigning an impervious cover percentage for each land use/land cover based upon data collected for the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) in Northeastern Illinois (Table 3-17). GIS was used to estimate the area of existing and projected land use/land cover by subbasin.

The Center for Watershed Protection has developed an Impervious Cover Model used to classify streams in the subwatersheds into stream quality categories based on percent impervious cover: Sensitive, Impacted and Non-Supporting. In general, sensitive subwatersheds have less than 10% impervious cover and typically have stable channels, good stream habitat, good water quality and diverse biological communities. Streams in the non-supporting category have impervious cover greater than 25% and typically have highly degraded channels, degraded habitat, impacted water quality, and impacted biological communities. Subwatersheds with impervious cover between 11% and 25% are considered impacted and could begin seeing degradation to stream channels, habitat, water quality, and biological communities.

Table 3-17 Summary of MWRDGC Impervious Cover Percentages

Land Use	Percent Impervious
Agricultural	5%
Conservation Neighborhood	15%
Forest and Grassland	5%
Government, Civic and Institutional	72%
Industrial	72%
Mixed Residential	65%
Mixed Use	85%
Multifamily Residential	65%
Office Space	85%
Open Space/Conservation/Parks	5%
Retail/Commercial	85%
Single-family Residential	30%
Transportation	95%
Utility/Waste Facility	5%

According to the impervious cover model, the East Branch South Branch Kishwaukee River Watershed has a current impervious cover of 11.9%. This would indicate that the stream channels in the watershed are considered "impacted" by surrounding land. An analysis of impervious cover within each of the three subwatesheds (East Branch South Branch, Union Ditch and Virgil Ditch) provides a better understanding of how the current and future land uses affects and will affect the watershed (Tables 3-18 to 3-20).

Table 3-18 Impervious Area Analysis Results in the East Branch South Branch Kishwaukee River Subwatershed

SMU	Total Acres	Existing Percent of Impervious	Future Percent of Impervious
EBKR-1	12.24	5.00%	5.00%
EBKR-2	2389.18	**37.13%**	**54.95%**
EBKR-3	1013.59	**33.01%**	**33.05%**
EBKR-4	2317.66	**28.44%**	**46.18%**
EBKR-5	3683.00	8.15%	14.96%
EBKR-6	1128.93	21.86%	19.09%
EBKR-7	5.48	10.12%	10.12%
EBKR-8	1419.61	18.19%	**24.40%**
EBKR-9	1450.96	17.77%	**25.55%**
EBKR-10	2857.50	7.50%	14.16%
EBKR-11	1890.84	14.58%	**27.03%**
EBKR-12	1827.37	8.14%	13.39%
EBKR-13	2751.66	**29.24%**	**58.45%**
EBKR-14	1475.90	8.40%	**37.93%**
Average Percent of Impervious for the E Branch S Branch Kishwaukee Subwatershed		17.67%	**27.45%**

Table 3-19 Impervious Area Analysis Results in the Union Ditch Subwatershed

SMU	Total Acres	Existing Percent of Impervious	Future Percent of Impervious
UD-1	28.76	12.79%	16.77%
UD-2	2147.38	14.47%	**44.06%**
UD-3	1006.23	11.39%	**57.91%**
UD-4	2821.78	8.58%	**39.43%**
UD-5	1807.45	9.36%	**29.89%**
UD-6	2028.09	16.31%	**32.40%**
UD-7	265.97	8.12%	8.00%
UD-8	3187.32	6.83%	8.57%
UD-9	266.38	5.87%	8.56%
UD-10	594.00	7.14%	8.39%
UD-11	3097.35	8.34%	8.44%
UD-12	2952.74	7.90%	7.77%
UD-13	3272.11	7.93%	14.59%
UD-14	3277.85	8.12%	14.08%
UD-15	4088.48	9.25%	19.98%
UD-16	2150.67	20.67%	**74.90%**
UD-17	1631.51	9.78%	**38.62%**
UD-18	2587.06	8.82%	8.49%
Average Percent of Impervious for the Union Ditch Subwatershed		10.10%	**24.49%**

Table 3-20 Impervious Area Analysis Results in the Virgil Ditch Subwatershed

SMU	Total Acres	Existing Percent of Impervious	Future Percent of Impervious
VD-1	1329.40	7.91%	13.77%
VD-2	1534.24	7.71%	13.05%
VD-3	163.91	8.98%	8.98%
VD-4	1831.67	7.39%	9.03%
VD-5	2455.17	10.40%	9.79%
VD-6	1112.19	9.29%	9.88%
VD-7	1319.43	8.01%	9.44%
VD-8	1542.02	7.46%	7.90%
VD-9	2423.26	6.66%	8.92%
VD-10	2259.68	7.38%	7.41%
VD-11	1387.79	6.69%	6.80%
Average Percent of Impervious for the Virgil Ditch Subwatershed		8%	9.54%

Using current land use, the East Branch South Branch of the Kishwaukee River subwatershed is approximately 17.8% impervious and would be considered "Impacted" based on Sheuler's model (Table 3-18). This data seems to correlate with visual and anecdotal evidenced observed in the watershed including problems such as channelization, sedimentation, erosion, debris jams, lack of riparian buffers and degraded stream habitat. Highly impervious areas surrounding Sycamore and Cortland are the primary reasons for the elevated impervious areas through this subwatershed.

Using current land use, the Union Ditch subwatershed (10.1% impervious) and Virgil Ditch subwatershed (8% impervious) are considered "sensitive" using the model. The scores at the high end of the "sensitive" rating confirm what is known about the subwatershed in that the stream channels are somewhat degraded, instream habitat has been altered and water quality and biological communities are slightly impacted.

A more telling picture is told by looking at the model's prediction of future imperviousness in the watershed. If growth occurs as predicted by the Land Use plans adopted by the counties and municipalities, both the East Branch South Branch of the Kishwaukee River subwatershed and the Union Ditch subwatershed will be considered "Not Supporting" by the model. As this growth occurs, if changes are not made to current development patterns, it is likely that significant degradation to the watershed including channelization, sedimentation, erosion, debris loading, and degraded stream habitat will occur. The degradation related to the proposed development can be reduced through the implementation of sustainable development that includes the use of best management practices (BMPs) and green infrastructure. More information on BMPs and green infrastructure can be found in Chapter 4 and Chapter 5. As Kane County does not predict much growth for the Virgil Ditch subwatershed, it would be expected to remain "sensitive".

Impervious cover was also modeled for the present and future conditions of each Subwatershed Management Units (SMU) within each of the subwatersheds. SMUs are smaller subwatersheds located within each of the three subwatersheds. The information obtained from analyzing the SMUs will be used in the identification of critical areas for watershed plan implementation. See Section 3.18 for more information on Critical Areas.

3.10 Cultural Resources

Cultural resources are sites, structures, buildings, landscapes, districts, and objects that are significant in history, prehistory, archeology, architecture, engineering, and/or culture. Knowing the cultural resources of a watershed provides information on changes that occurred in the landscape and help define information related to historical vegetative communities, climate change, wildlife populations, and historic uses of the land. All of which could be useful during the watershed planning process. Additionally, as cultural resources provide learning opportunities for the public, the preservation and protection of the cultural resources located in the watershed from development and damage is an important objective of watershed planning.

In 1966, the National Historic Preservation Act was passed to manage and protect cultural resources by requiring Federal and State agencies to establish historic preservation programs to identify, evaluate, and protect important sites under their jurisdiction. The National Park Service administers the National Register of Historic Places as part of the requirements of the National Historic Preservation Act. Properties in the Register include districts, sites, buildings, structures, and objects that are significant in American history, archeology, architecture, engineering, and culture. The National Register sites have been nominated by governments, organizations, and individuals according to a defined, uniform set of standards. According to the National Register of Historical Places, there are six Historic Places/Districts listed for the East Branch South Branch Kishwaukee River watershed (Table 3-21 and Figure 3-14).

Table 3-21 National Register of Historic Places in the East Branch South Branch Kishwaukee River watershed

Site Name	Address	Certification Date
Brower, Adolphus W., House	705 DeKalb Avenue Sycamore, DeKalb, Illinois	02/14/1979
Chicago and Northwestern Depot	Sacramento and DeKalb Streets Sycamore, DeKalb, Illinois	12/08/1978
Elmwood Cemetery Gates	S. Cross and Charles Streets Sycamore, DeKalb, Illinois	11/28/1978
Marsh, William W., House	740 W. State Street Sycamore, DeKalb, Illinois	12/22/1978
North Grove School	26475 Brickville Road Sycamore, DeKalb, Illinois	02/15/2012
Sycamore Historic District	Irregular pattern along Main and Somonauk Streets Sycamore, DeKalb, Illinois	05/02/1978

In Illinois, the Illinois Historical Preservation Agency (IHPA) preserves and protects public and private historical properties and library collections. The IHPA Historic Architecture and Archeological Resource Geographic Information System (HAAGIS) (http://gis.hpa.state.il.us/hargis/) was utilized to locate and identify Illinois Historic Sites and Monuments in the East Branch South Branch Kishwaukee River database. There are no sites within the East Branch South Branch Kishwaukee River watershed identified on the HAAGIS site as Illinois Historic Sites and Monuments.

In Kane County, the Kane County Board of Commissioners has included four properties in the East Branch South Branch Kishwaukee River watershed in the Kane County Register of Historical Preservation Figure 1-14): Beith House, Kaut House, Read House, and South Burlington Community House. By placing these assets on the Register for Historic Places, the Kane County Historic Preservation Commission is given the authority to "review significant exterior alterations, additions, new construction or demolitions proposed for designated landmarks or within historic districts." As a result, historical assets are able to be carefully managed in the face of growing construction efforts in Kane County.

3.11 Transportation

The impact of streets and highways on the watershed, particularly water quality, is significant. Table 3-22 lists a number of water quality pollutants and their sources, all of which are associated with the transportation system. Rain water flowing over the surface of our streets can carry these pollutants into our wetlands and streams, where they can accumulate and impair the quality of these resources for aquatic life.

Table 3-22 Transportation Related Pollutants

Pollutant	Primary Sources
Particulates	Pavement wear, atmosphere, vehicles
Nutrients including nitrogen and phosphorus	Atmosphere, fertilizer application
Lead	Tire wear, exhaust
Zinc	Tire wear, motor oil and grease
Iron	Rust, steel highway structures, engine parts
Copper	Metal plating, break lining wear, engine parts, bearing and bushing wear, fungicides and pesticides
Cadmium	Tire wear, insecticides
Chromium	Metal plating, engine parts, break lining wear
Nickel	Diesel fuel, gasoline, oils, metal plating, break lining wear, asphalt paving
Manganese	Engine parts
Cyanide	Anticake compound used in deicing salts
Sodium, Calcium, Chloride	Deicing salts
Sulphate	Fuel, deicing salts
Petroleum	Spills and leaks of motor oils, antifreeze and hydraulic fluids, asphalt surface leachate

3.11.1 Existing Transportation Network

Several major arterial roads and one interstate transverse the East Branch South Branch Kishwaukee River watershed including Illinois State Route 47, Illinois State Route 23, Illinois State Route 64, Illinois State Route 38, and Interstate 88. Illinois State Route 47 is located in the eastern portion of the watershed and runs north to south. Lily Lake and Campton Hills are situated along Illinois State Route 47. Illinois State Route 23 is a north-south road running through the City of Sycamore in the western portion of the watershed. Illinois State Route 64 is the main east-west highway bisecting the watershed as it runs on a northwesterly angle through Lily Lake, Virgil, and Sycamore. Illinois State Route 38 is located in the southern portion of the watershed and runs east-west through Cortland, Maple Park, and Elburn. Interstate 88 runs east to west in the southwest corner of the watershed south of Cortland and Maple Park. Figure 3-15 depicts the transportation network found in the watershed.

3.11.2 Proposed Transportation Projects

There are no significant road construction or road widening projects proposed in the East Branch South Branch Kishwaukee watershed. As such, no changes to the existing transportation network are presumed to occur in the watershed.

3.12 Natural Resources

This section of the plan describes the natural areas within the East Branch South Branch Kishwaukee River watershed, including natural areas, parks, recreational trails, plant and animal species concerns, wetlands, and groundwater.

3.12.1 Illinois Natural Area Inventory Sites

Illinois Natural Areas Inventory (INAI) sites are a designation established in the 1970's by the Illinois Nature Preserves Commission (INPC) to identify "high quality" areas of the natural features found in Illinois. Included in the INAI inventory is a system to classify natural communities based on a grading scale related to the quality of the natural area. Portions of one INAI site is located in the watershed: Elburn Forest Preserve (Figure 3-16).

Elburn Forest Preserve

Approximately 5.2 acres of the 57.1 acre Elburn Forest Preserve is located in the Union Ditch subwatershed. The Elburn Forest Preserve is owned by the Forest Preserve District of Kane County. The Elburn Forest Preserves is a morainal, gravel hill at the county watershed divide, which separates the Fox and Kishwaukee River Basins. It is a high quality savanna woodland dominated by White, Black and Bur Oak and Shagbark Hickory. Kane County's largest Shagbark is located within this preserve. The Preserve is also home to many classic, spring ephemeral plants, including trillium, buttercups and violets. Additionally, the Preserve is home to Kane County's squirrel preserve, where you can find both Fox and Gray squirrels living compatibly with each other, as well as Flying Squirrels.

3.12.2 Forest Preserves and Parks

3.12.2.1 Municipal Parks

The Town of Cortland and Sycamore Park District manage numerous recreational parks located entirely or partially within the watershed. These facilities and a description of their amenities are included in Table 3-23 and depicted on Figure 3-17.

Table 3-23 Natural Areas and Recreational Parks in the East Branch South Branch Kishwaukee River watershed

Park Name	Address	Acreage in Watershed	Golf Course	Natural Areas	Playground	Tennis Count	Ball Diamond	Basketball Court	Soccer Field
Town of Cortland									
Cortland Community Park	70 S Llanos Street, Cortland, Illinois	19.40					✓		
Hetchler Park	Ellen Avenue, Cortland, Illinois	4.98					✓	✓	
McPhillips Park	1-103 W Prairiefield Ave, Cortland, Illinois	8.77			✓		✓	✓	✓
Suppland Park	Meadow Drive, Cortland, Illinois	6.78		✓					
Welsh Park	North Avenue, Cortland, Illinois	0.42			✓				
Sycamore Park District									
Boynton Park	303 Northgate Dr. Sycamore, Illinois	2.40		✓					

Park Name	Address	Acreage in Watershed	Golf Course	Natural Areas	Playground	Tennis Count	Ball Diamond	Basketball Court	Soccer Field
Charley Laing Memorial Park	325 S. Main St. Sycamore, Illinois	0.56			✓				
Chief Black Partridge Nature Preserve	2112 Frantum Rd. Sycamore, Illinois	15.23		✓					
Elmer and Stanley Larson Park	1501 John St. Sycamore, Illinois I	0.27			✓				
Emil Cassier Park	500 Olin H. Smith Dr. Sycamore, Illinois	70.71		✓					
Founders Park	500 Heron Creek Dr. Sycamore, Illinois	2.76			✓				
Future Park		29.52							
Kiwanis East Park	555 Borden Ave. Sycamore, Illinois	1.91		✓					
Kiwanis Prairie Park	800 Borden Ave. Sycamore, Illinois	7.47			✓	✓	✓	✓	✓
Leon D. Larson Memorial Park	1212 Larsen St. Sycamore, Illinois	23.11		✓					
Old Mill Park	50 Mt. Hunger Rd. Sycamore, Illinois	20.29		✓					
Parkside Preserve	1212 Freedom Circle Sycamore, Illinois	134.69		✓					
Reston Ponds	444 Becker Pl. Sycamore, Illinois	3.15		✓					
Sycamore Community Park	940 E. State St. Sycamore, Illinois	224.10	✓		✓				
Sycamore Lake Rotary Park	400 North Cross St. Sycamore, Illinois	12.83			✓				
Wetzel Park	212 Rowantree Dr. Sycamore, Illinois	1.92			✓	✓	✓	✓	

No municipal parks are located within the Kane County portion of the watershed.

3.12.2.2 Forest Preserve District of Kane County

In addition to the Elburn Forest Preserve discussed in Section 1.12.1, there are three additional properties managed by the Forest Preserve District of Kane County (FPDKC) located in the watershed: Cardinal Creek Forest Preserve, Great Western Trail, and Virgil Forest Preserve (Figure 3-17).

Cardinal Creek Forest Preserve
The 165.7 acre Cardinal Creek Forest Preserve is located in the Virgil Ditch watershed.

Great Western Trail
Approximately 14 miles of the Great Western Trail are owned and managed by the FPDKC. Of these 14 miles, 6.62 miles are located in the Kane County portion of the East Branch South Branch Kishwaukee watershed (2.98 miles within the Virgil Ditch subwatershed and 3.64 within the Union Ditch subwatershed). See Section 3.12.3 for more information on the Great Western Trail.

Virgil Forest Preserve
The 1,139 acre Virgil Forest Preserve is located in the Union Ditch (568.7 acres) and Virgil Ditch (555.7 acres) subwatershed. Virgil Ditch #2 and Virgil Ditch #3 transect this property.

3.12.2.3 DeKalb County Forest Preserve District

The DeKalb County Forest Preserve manages the DeKalb County portion of the Great Western Trail. See Section 3.12.3 for more information on the Great Western Trail.

3.12.3 Pedestrian Trails

There are two pedestrian/recreational trails located within or partially within the East Branch South Branch Kishwaukee River watershed: Great Western Trail and DeKalb/Sycamore Bike Path (Figure 3-18).

Great Western Trail
The Great Western Trail extends approximately 17 miles from its trailhead in St Charles, Kane County, Illinois to Sycamore, DeKalb County, Illinois. The trail connects to the Fox River Trail in Kane County and to a larger regional trail system. Approximately 9.6 miles of trail are located within the East Branch South Branch Kishwaukee River watershed.

The Great Western trail follows the abandoned Chicago Great Western Railway corridor and is surfaced with limestone screenings. Bicycling, hiking, and snowmobiling when there is 4" of snow are permitted on the trail. Horseback riding is also allowed on the mowed shoulder along the trail. Shelters and rest areas are located along the trail.

The Great Western Trail crosses small streams and wetlands where duck, coot and the Great Blue Heron nest and raise their young. Shrubs, including Dogwood, Blackberry and Hazelnut mingle with the few remaining patches of native prairie. It is a place of quiet beauty, a linear wildlife refuge, and truly one of the finer experiences available in DeKalb and Kane County.

DeKalb/Sycamore Bike Path
The DeKalb/Sycamore Bike Path starts at Pleasant Street in DeKalb, Illinois and extends north and east into the City of Sycamore, Illinois. The paved trail is six miles in length with

wooded and prairie features. The Trail follows along the east side of Peace Road for several miles before winding its way into the Sycamore Community Park. Trail users include bicyclists, hikers, runners, and cross country skiers.

Figure 3-18 shows the location of each of the pedestrian trails located in the East Branch South Branch Kishwaukee River watershed.

3.12.4 Threatened and Endangered Species

The Illinois Endangered Species Protection Board was created by the passage of the Endangered Species Protection Act in 1972 and determines which plant and animal species are threatened or endangered (T&E) in the state. The Illinois Endangered Species Protection Board also advises the Illinois Department of Natural Resources (IDNR) on means of conserving those species. State listed T&E species are designated "endangered" if a species is in danger of extinction as a "breeding" species and is considered "threatened" if the species is likely to become an endangered species within the foreseeable future. Figure 3-19 shows the general location of all T&E species within the watershed based on the Illinois Endangered Species Protection Board 2006 Endangered and Threatened Species List. Table 3-24 lists each of the T&E species and provides its status.

Table 3-24 Threatened and Endangered Species

Common Name	Scientific Name	Status
Dog Violet	*Viola conspersa*	Threatened
Iowa Darter	*Etheostoma exile*	Threatened
Slippershell	*Alasmidonta viridis*	Threatened
Wooly Milkweed	*Asclepias lanuginosa*	Endangered

3.12.5 Wetlands

Wetlands, once prevalent within Illinois, have continued to decline in area and quality. Wetlands are of interest to watershed studies of this sort due to the benefits they provide. Wetlands do more for water quality improvement and flood damage reduction than any other natural resource within a watershed. Wetlands provide a multitude of ecological, economic and social benefits. They provide habitat for fish, wildlife and a variety of plants. Wetlands are also important landscape features because they hold and slowly release flood water and snow melt, recharge groundwater, recycle nutrients, and provide recreation and wildlife viewing opportunities for residents.

NWI Wetland Inventories

The National Wetlands Inventory (NWI) is available for DeKalb County. The NWI was established by the US Fish and Wildlife Service (FWS) to conduct a nationwide inventory of U.S. wetlands to provide biologists and others with information on the distribution and type of wetlands to aid in conservation efforts. The NWI maps are prepared from the analysis of high altitude imagery, vegetation, visible hydrology, and geography. Field inspections and wetland delineations were not utilized in the preparation of the NWI maps. Additionally, certain wetland habitats are not included on their maps due to limitations of aerial reconnaissance to properly identify these habitats as wetlands. According to the NWI maps, there are approximately 1,214.45 acres of wetland in DeKalb County (1.54% of the watershed). Of the 1,214.75 acres, 859.34 acres are located within the East Branch South

Branch Kishwaukee subwatershed, 350.59 in the Union Ditch subwatershed, and 4.53 in the Virgil Ditch subwatershed (Figure 3-20).

Advanced Identification (ADID)Wetlands
In 2004, Kane County implemented the Advanced Identification (ADID) process of wetlands in an attempt to identify highly functional wetlands that should be protected because of their high quality plant communities and/or functional values. The ADID program is an US Environmental Protection Agency (USEPA) and US Army Corps of Engineers (USACE) guided program developed to shorten permit-processing time related to filling wetlands and to provide information to local governments. Three primary functions were used by the USEPA and USACE to evaluate wetlands during the ADID process including biological value (i.e. wildlife habitat and plant species diversity), hydrologic functional value (i.e. stormwater storage or bank stabilization), and water quality value (i.e. sediment and nutrient removal). The survey identified 1,260.52 acres of wetlands in Kane County (1.60% of the watershed. Of the 1,260.52 acres, 768.17 acre are located in the in the Union Ditch subwatershed and 492.36 in the Virgil Ditch subwatershed (Figure 3-21). Per the identification process, twenty one wetlands totaling 501.94 acres are high functional value (HFV) and one 7.52 acre wetland as a high habitat quality (HHQ) wetland in the ADID study. Data for each HFV and HHQ wetland is summarized in Table 3-25 and shown on Figure 3-21.

Table 3-25 Kane County HFV and HHQ wetlands

ADID ID#	Acres	ADID Attributes
3467	18.02	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1548	26.87	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
989	16.30	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
996	10.18	**Water Quality/Hydrology** Stormwater storage, sediment/toxicant retention**:**
997	11.77	**Water Quality/Hydrology** Stormwater storage, sediment/toxicant retention**:**
1015	12.17	**Water Quality/Hydrology** Stormwater storage, sediment/toxicant retention**:**
1016	13.33	**Water Quality/Hydrology:** Sediment/toxicant retention
1040	17.11	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1166	16.98	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1511	15.61	**Water Quality/Hydrology:** Sediment/toxicant retention
1518	16.73	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1555	14.59	**Water Quality/Hydrology:** Sediment/toxicant retention
1568	43.96	**Water Quality/Hydrology:** Sediment/toxicant retention
1575	31.14	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1581	16.99	**Water Quality/Hydrology:** Sediment/toxicant retention
1684	12.55	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
3236	33.59	**Water Quality/Hydrology:** Streambank/shoreline stabilization, sediment/toxicant retention
3241	10.22	**Water Quality/Hydrology:** Streambank/shoreline stabilization, sediment/toxicant retention
3243	106.75	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
3244	36.66	**Water Quality/Hydrology:** Nutrient removal, sediment/toxicant retention
3245	20.44	**Water Quality/Hydrology:** Sediment/toxicant retention
1024	7.52	**Biological:** Sedge meadow **Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention

In addition to the twenty two HFV and HHQ wetlands, one farmed wetland and twenty two wetlands (169.99 acres) were noted for their significant water quality and stormwater functions. These wetlands met basic criteria of "significant functional" value but did not qualify for the high functional value rating. Due to their significant water quality and stormwater functions these wetlands should be preserved and/or restored when feasible. Table 3-26 and Figure 3-21 includes the Kane County significant functional wetlands.

Table 3-26 Kane County significant functional wetlands

ADID ID#	Acres	ADID Attributes
1574	8.61	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
978	5.82	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
979	6.42	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
980	6.45	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
982	5.60	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1002	5.13	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1018	5.29	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1023	3.17	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1028	9.62	**Water Quality/Hydrology:** Streambank/shoreline stabilization
1029	5.75	**Water Quality/Hydrology:** Sediment/toxicant retention
1032	5.13	**Water Quality/Hydrology:** Sediment/toxicant retention
1038	8.27	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1039	5.27	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1220	5.43	**Water Quality/Hydrology:** Sediment/toxicant retention
1558	7.52	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
1616	8.02	**Water Quality/Hydrology:** Streambank/shoreline stabilization, sediment/toxicant retention
3242	6.02	**Water Quality/Hydrology:** Sediment/toxicant retention
3247	16.29	**Water Quality/Hydrology:** Sediment/toxicant retention
3248	11.52	**Water Quality/Hydrology:** Sediment/toxicant retention
3254	3.61	**Water Quality/Hydrology:** Streambank/shoreline stabilization
3345	8.47	**Water Quality/Hydrology:** Stormwater storage, sediment/toxicant retention
3356	5.89	**Water Quality/Hydrology:** Sediment/toxicant retention
3370	7.70	**Water Quality/Hydrology:** Streambank/shoreline stabilization, sediment/toxicant retention

ADID wetland information is not available for DeKalb County.

In order to protect wetlands, projects and other activity should be designed to avoid and minimize any disturbance to the wetland, stream, or other aquatic area. However, if there is an unavoidable impact or disturbance to a wetland or stream, a Clean Water Act Section 404 permit must be obtained from the US Army Corps of Engineers (USACE). The USACE has jurisdiction over waters of the United States (WOUS) including connected wetlands and navigable streams and rivers. For wetlands and WOUS in the East Branch South Branch Kishwaukee River watershed, the USACE Rock Island District is the responsible entity for permitting any activities that impact jurisdictional wetlands and WOUS. The Rock Island permit program includes a series of regional permits (RP) for various activities such as bank stabilization, flood damage control and road crossings. Activities outside the RP categories are required to obtain an individual permit (IP). The USACE permits must be applied for and issued before any wetland or WOUS disturbance or impacts occur.

3.12.6 Potential Wetland Restoration Sites

Wetland restoration and creation could be beneficial to the East Branch South Branch Kishwaukee River watershed. By restoring the environmental functions of impacted wetlands or creating new wetlands in suitable areas, wetland restoration and wetland creation could potentially reduce flood volumes and rates, increase plant and animal diversity, and improve water quality conditions.

Potential restoration sites were identified using a Geographic Information System (GIS) exercise. As part of this exercise, an initial criterion of 10 acres parcels with hydric soils was utilized. This identified 789 potential wetland restoration sites (17,707.61 acres) within the watershed. Additional criterions and a rating scale were then used to better identify potential wetland sites. These criterions include:

- Hydric Soil Order: Histosol (organic hydric soils) were given preference to Mollisol (mineral hydric soils) as Histosol soils are known to respond better to restoration than Mollisol soils. Histosol soils tend to be easier to rehydrate as they are typically wet and provide better soils for wetland plant establishment. Histosol soils were assigned a 1 on the rating scale and Mollisol soils were assigned a 0.
- Riparian: Preference was given to sites that were located immediately adjacent to a stream or ditch. Sites located immediately adjacent to a stream or ditch were assigned a 1 on the rating scale.
- Riparian (within 1,000 feet): Preference was given to sites that were located within 1,000 feet of a stream or ditch. Sites located within 1,000 feet of a stream or ditch were assigned a 1 on the rating scale.
- Floodplain: Preference was given to sites that were located within the 100-year floodplain. Sites located within the 100-year floodplain were assigned a 1 on the rating scale.
- Adjacent to ADID or NWI wetlands: Preference was given to sites located immediately adjacent to ADID or NWI wetlands. Sites located immediately adjacent to a ADID or NOW wetland were assigned a 1 on the rating scale.

The maximum rank value that any potential wetland location site can receive is five (5). Of the 789 sites (17,707.61 acres) originally identified, 9 sites (177.6 acres) had a value of 5. These sites are included in Table 3-27 and shown on Figure 3-22. One hundred and fifty one (151) potential restoration sites had a ranking of 4. For all of the sites ranked 4, they are of the Mollisol soil type and thus did not earn a point for soil order. Table 3-27 and Figure 3-22 also list 64 additional sites (2,889.6 acres) that have acreage of at least 25 acres and Ranking of 4. A size of 25 acres was chosen for inclusion in the table as the larger sites would be a priority for restoration as they would have the highest functional value. Table 3-27 also identifies if the wetland is located on public lands.

Table 3-27 Potential Restoration Sites in the East Branch South Branch Kishwaukee River Watershed

ID	Acres	Soil Order Score	Riparian Score	Riparian (within 1,000 feet) Score	Floodplain Score	Adjacent to ADID or NWI Wetland Score	Ranking	Public Ownership
Potential Restoration Sites with a Ranking of 5								
1	14.7	1	1	1	1	1	5	
2	16.2	1	1	1	1	1	5	
3	28.1	1	1	1	1	1	5	
4	23.9	1	1	1	1	1	5	
5	19.2	1	1	1	1	1	5	
6	31.1	1	1	1	1	1	5	
7	11.8	1	1	1	1	1	5	
8	18.4	1	1	1	1	1	5	
9	14.3	1	1	1	1	1	5	
Potential Restoration Sites with a Ranking of 4								
10	102.01	0	1	1	1	1	4	
11	93.69	0	1	1	1	1	4	
12	92.32	0	1	1	1	1	4	
13	82.81	0	1	1	1	1	4	
14	74.85	0	1	1	1	1	4	
15	71.84	0	1	1	1	1	4	
16	67.79	0	1	1	1	1	4	
17	66.46	0	1	1	1	1	4	
18	65.89	0	1	1	1	1	4	Yes
19	65.73	0	1	1	1	1	4	
20	65.09	0	1	1	1	1	4	
21	63.90	0	1	1	1	1	4	Yes
22	62.99	0	1	1	1	1	4	
23	60.55	0	1	1	1	1	4	
24	58.45	0	1	1	1	1	4	
25	56.08	0	1	1	1	1	4	
26	55.98	0	1	1	1	1	4	
27	51.87	0	1	1	1	1	4	
28	47.22	0	1	1	1	1	4	
29	46.50	0	1	1	1	1	4	
30	45.13	0	1	1	1	1	4	
31	45.08	0	1	1	1	1	4	
32	44.51	0	1	1	1	1	4	
33	44.39	0	1	1	1	1	4	
34	43.74	0	1	1	1	1	4	Yes
35	43.55	0	1	1	1	1	4	
36	43.43	0	1	1	1	1	4	
37	42.84	0	1	1	1	1	4	
38	42.42	0	1	1	1	1	4	
39	42.00	0	1	1	1	1	4	
40	39.84	0	1	1	1	1	4	
41	39.39	0	1	1	1	1	4	
42	39.28	0	1	1	1	1	4	
43	39.22	0	1	1	1	1	4	
44	36.83	0	1	1	1	1	4	

ID	Acres	Soil Order Score	Riparian Score	Riparian (within 1,000 feet) Score	Floodplain Score	Adjacent to ADID or NWI Wetland Score	Ranking	Public Ownership
45	36.75	0	1	1	1	1	4	
46	36.66	0	1	1	1	1	4	
47	36.30	0	1	1	1	1	4	
48	35.31	0	1	1	1	1	4	
49	34.62	0	1	1	1	1	4	
50	34.26	0	1	1	1	1	4	
51	34.26	0	1	1	1	1	4	Yes
52	34.02	0	1	1	1	1	4	
53	33.60	0	1	1	1	1	4	
54	33.33	0	1	1	1	1	4	
55	33.16	0	1	1	1	1	4	
56	33.08	0	1	1	1	1	4	
57	32.68	0	1	1	1	1	4	
58	32.62	0	1	1	1	1	4	
59	32.28	0	1	1	1	1	4	
60	31.98	0	1	1	1	1	4	
61	31.93	0	1	1	1	1	4	
62	29.21	0	1	1	1	1	4	
63	29.10	0	1	1	1	1	4	
64	28.51	0	1	1	1	1	4	Yes
65	28.32	0	1	1	1	1	4	
66	27.74	0	1	1	1	1	4	
67	27.56	0	1	1	1	1	4	
68	27.56	0	1	1	1	1	4	
69	27.43	0	1	1	1	1	4	
70	26.94	0	1	1	1	1	4	
71	25.67	0	1	1	1	1	4	
72	25.66	0	1	1	1	1	4	
73	25.39	0	1	1	1	1	4	

3.12.7 Groundwater in the East Branch South Branch Kishwaukee River Watershed

Underlying the ground surface of the watershed is a thick layer (several hundred feet) of unconsolidated material including sand, gravel, clay and silt. These materials were laid down tens of thousands of years ago when glaciers covered this part of the country. Underneath these unconsolidated materials is several thousand feet of sedimentary rock consisting of alternating dolomite, sandstone, and shale formations. These formations were deposited in shallow seas and near coastlines during the Cambrian and Tertiary Periods (543-290 million years ago). Between 290 million years ago and today, the exposed bedrock surface was erodes by rivers and streams into a complex Valley Systems known as the Troy bedrock valley located in western DeKalb County. The advancing and retreating glaciers of the last ice age deposited the sand, gravel, clay and silt that eventually filled the Troy Valley and formed the landscape observed today.

The sand and gravel glacial aquifers in the Troy Valley recharge the sandstone bedrock aquifers where the Troy Valley aquifers are in direct contact with the bedrock surface. Immediately under the Troy Valley is the shallowest bedrock aquifer in the area, referred to as the Galena/Platteville Dolomite aquifer. The bottom aquifer unit of the Troy Valley lies directly above the bedrock surface. As such, the Troy Valley is one of the primary sources for recharging the deep sandstone aquifers on which much of DeKalb County and many of the suburbs west of Chicago depend upon for clean drinking water upon for clean drinking water

Aquifers in the glacial drift (sand and gravel) of the Quaternary age (less than 75,000 year old) and the carbonate deposits (dolomite and limestone) of the Platteville and Galena Group of Ordovician age (about 450 million years old) are the major sources of groundwater in the watershed. These glacial drift and Galena-Platteville aquifers are considered to be extremely susceptible to contamination as the aquifer is near the land surface, typically at a depth of less than 50 feet, and the soils compose and overlie the aquifers have relatively high hydraulic conductivity of at least 1 foot per day.

Residents in the East Branch South Branch Kishwaukee River Watershed utilize groundwater for a variety of purposes including drinking water, irrigation, and industrial process water. All of the municipalities in the wateshed use groundwater as their source of drinking water. While under natural undisturbed conditions, groundwater in the East Branch South Branch Kishwaukee River Watershed is of high quality and meets the drinking and groundwater standards set for different contaminants by the Illinois Pollution Control Board. Due to the nature of the aquifers in the region, impacts associated with urbanization have the potential to negatively impact drinking and groundwater. Potential sources for contamination associated with urbanization include septic system effluent, oil, gasoline, animal wastes, industrial effluent, paint, solvents, road salt, and lawn and household chemicals.

In order to protect groundwater in Illinois in 1987, the General Assembly passed the Illinois Groundwater Protection Act (IGPA). The IGPA emphasizes the comprehensive management of groundwater resources by requiring the implementation of practices and policies to protect groundwater. These include setting groundwater protection policies such as setback zones; assessing the quality and quantity of groundwater resources being utilized; and establishing groundwater standards.

3.12.8 Agricultural Best Management Practices

Various programs sponsored by the Natural Resource Conservation Service (NRCS) and Farm Service Agency Wetlands Reserve Program (WRP), Grasslands Reserve Program (GRP), Wildlife Habitat Incentives Program (WHIP), Environmental Quality Incentives Program (EQIP), Conservation Reserve Enhancement Program (CREP), and Conservation Reserve Program (CRP) promote and fund the construction of agricultural BMPs on farmland.

According to information obtained from the DeKalb County Soil and Water Conservation District (DC SWCD), there are 36 acres of riparian buffers, 36 acres of vegetative filter strips, 46 acres of grass waterways, and 123.21 acres of wetland enhancement in the DeKalb County portion of the watershed preserved by the above-listed programs.

Per the requirements of Section 1619, b, 4, B of the Farm Bill, the Natural Resource Conservation Service (NRCS) in Champaign, Illinois is only able to provide the number of contracts and the obligation amount by County for following programs: WRP, GRP, WHIP, and EQIP. According to the NRCS, there are no active or completed WHIP contracts in both DeKalb and Kane Counties. Additionally, no GRP easements have been issued in either County. The following tables provide information on the number of contracts and obligations amounts for WRP and EQIP.

Table 3-28 WRP Easements in DeKalb and Kane Counties

County	Easement Values	Restoration Value
DeKalb	$235,000.00	$0.00
Kane	$0.00	$0.00

Table 3-29 Active and Completed EQIP Contracts in DeKalb County

Fiscal Year	Number of Contracts	Obligation Amount
2008	16	$121,623.00
2009	6	$245,091.74
2010	3	$38,548.19
2011	3	$384,576.10
2012	9	$161,486.19
2013	17	$260,307.38

Table 3-30 Active and Completed EQIP Contracts in Kane County

Fiscal Year	Number of Contracts	Obligation Amount
2008	6	$38,000.00
2009	1	$24,588.70
2010	1	$6,926.04
2011	1	$9,686.20
2012	2	$48,486.75
2013	4	$103,166.00

3.13 Natural Drainage System

This section describes the conditions and characteristics of the natural drainage system of the East Branch South Branch Kishwaukee River watershed.

3.13.1 Stream Flow/Discharge

There are no active USGS gauging stations on East Branch South Branch Kishwaukee River or within the East Branch South Branch Kishwaukee River watershed. Historically, the US Geological Survey (USGS) had a gage on Virgil Ditch No. 3/Union Ditch No. 3 at the Illinois Route 64 bridge, west of Virgil; however, no data has been collected at this location since 1981.

In June 1988, the US Army Corps of Engineers (ACOE) released the Reconnaissance Report for Section 205 Flood Control, East Branch of the South Branch Kishwaukee River, DeKalb County, Illinois. Table 3-31 includes the discharge summary for the mouth of the Branch South Branch Kishwaukee River as included in the report.

Table 3-31 1988 Discharge Summary

Location	Slope	Flow-Frequency Values in ft³/s				
		2-Year	10-Year	50-Year	100-Year	500-Year
At mouth	5 foot/mile	2,050	4,280	6,120	6,870	8,490

3.13.2 Watershed Hydrology and Hydraulics

Hydrology and hydraulics are commonly used terms to describe the effects of precipitation, runoff, and evaporation on the flow of water in streams and rivers and on adjacent land surfaces. The basis for hydrology and hydraulics studies typically starts with an understanding of how topography delineates the land into watershed and subwatersheds. As discussed in the Topography section of this report, the Online Watershed Delineation (HYMAPS-OWL) tool, created by Department of Agriculture and Biological Engineering at Purdue University was used to create the initial subwatershed boundaries. The subwatershed boundaries generated by HYMAPS-OWL were then cross referenced with boundaries obtained by inputting 2-foot topography into the GIS-based model, Arc Hydro. This combined data generated a Digital Elevation Model (DEM) that was used to delineate and refine the watershed and subwatershed boundaries for East Branch South Branch Kishwaukee River. Inconsistency in the two models' delineations was altered to reflect real-world conditions and more accurately depict the hydrologic boundaries. Most of these inconsistencies occurred in areas divided by roadways that were not accounted for the in model.

The East Branch South Branch Kishwaukee River watershed drains 123.12 square miles. Broad assessment of conditions such as soils, wetlands, and water quality are often evaluated at watershed levels and provide great information of the overall condition of the watershed. However, a more detailed look at smaller drainage areas will often be helpful in finding specific problem areas. As previously discussed the East Branch South Branch Kishwaukee River watershed includes three major subwatersheds: East Branch South Branch Kishwaukee River, Union Ditch and Virgil Ditch. For the purposes of this report, each of the major subwatersheds have been broken down into subwatershed management units (SMU) (Tables 3-32 to 3-34. Figure 3-23 to 3-25 depicts the location of each of the SMUs by subwatershed.

Table 3-32 SMUs in the East Branch South Branch Kishwaukee River Subwatershed

SMU	Total Acres	Percent of Subwatershed
EBKR-1	12.24	0.05%
EBKR-2	2389.18	9.86%
EBKR-3	1013.59	4.18%
EBKR-4	2317.66	9.57%
EBKR-5	3683.00	15.20%
EBKR-6	1128.93	4.66%
EBKR-7	5.48	0.02%
EBKR-8	1419.61	5.86%
EBKR-9	1450.96	5.99%
EBKR-10	2857.50	11.80%

SMU	Total Acres	Percent of Subwatershed
EBKR-11	1890.84	7.81%
EBKR-12	1827.37	7.54%
EBKR-13	2751.66	11.36%
EBKR-14	1475.90	6.09%

Table 3-33 SMUs in the Union Ditch Subwatershed

SMU	Total Acres	Percent of Subwatershed
UD-1	28.76	0.08%
UD-2	2147.38	5.77%
UD-3	1006.23	2.70%
UD-4	2821.78	7.58%
UD-5	1807.45	4.86%
UD-6	2028.09	5.45%
UD-7	265.97	0.71%
UD-8	3187.32	8.57%
UD-9	266.38	0.72%
UD-10	594.00	1.60%
UD-11	3097.35	8.32%
UD-12	2952.74	7.94%
UD-13	3272.11	8.79%
UD-14	3277.85	8.81%
UD-15	4088.48	10.99%
UD-16	2150.67	5.78%
UD-17	1631.51	4.38%
UD-18	2587.06	6.95%

Table 3-34 SMUs in the Virgil Ditch Subwatershed

SMU	Total Acres	Percent of Subwatershed
VD-1	1329.40	7.66%
VD-2	1534.24	8.84%
VD-3	163.91	0.94%
VD-4	1831.67	10.55%
VD-5	2455.17	14.14%
VD-6	1112.19	6.41%
VD-7	1319.43	7.60%
VD-8	1542.02	8.88%
VD-9	2423.26	13.96%
VD-10	2259.68	13.02%
VD-11	1387.79	7.99%

3.13.3 Flow Paths

Three primary subwatersheds drain the East Branch South Branch Kishwaukee River watershed: East Branch South Branch Kishwaukee River, Union Ditch, and Virgil Ditch. The flow paths of each subwatershed are detailed below.

Virgil Ditch Subwatershed

The Virgil Ditch subwatershed is located in northeast portion of the watershed and is 20.12 square miles in size. There are 13.68 miles of stream in the subwatershed with the Virgil Ditch Number #3 being the primary tributary. The headwaters of Virgil Ditch Number 3 are located in the southwest portion of Burlington, approximately 1,500 feet east of the intersection of Chapman Road and Godfrey Road. From Burlington, Virgil Ditch Number 3 flows in a southerly direction. South of Ramm Road, Virgil Ditch Number 3 flows through the Virgil Forest Preserve. After leaving the Virgil Forest Preserve, Virgil Ditch Number 3 flows south/southwesterly under Peplow Road, the Great Western Trail, and Illinois State Route 64. South of Illinois State Route 64, Virgil Ditch Number 3 flows along the eastern edge of Midwest Ground Covers as it continues to flow in a southerly direction to its confluence with Union Ditch Number 3, approximately 2,100 feet south of Winter Road. There are four small unnamed tributaries to Virgil Ditch Number 3 located within the subwatershed.

For planning purposes, streams in the subwatershed were divided into unique stream reaches. The reaches for the Virgil subwatershed are depicted in Figure 3-26.

Union Ditch Subwatershed

The Union Ditch subwatershed is located in south and southeast/eastern portion of the watershed and is 58.14 square miles in size. The Union Ditch subwatershed is predominately located within Kane County. There are 37.7 miles of stream in the subwatershed. There are five primary tributaries in the Union Ditch subwatershed: Virgil Ditch Number 2, Virgil Ditch Number 1, Union Ditch Number 1, Union Ditch Number 2, and Union Ditch Number 3.

The headwaters of Virgil Ditch Number 2 are located in Campton Hills, approximately 1,350 feet south of the intersection of Connor Road and Illinois State Route 47. From Campton Hills, Virgil Ditch Number 2 flows in an easterly direction through agricultural fields before turning to the south just east of Kendall Road. From this point, Virgil Ditch Number 2 flows in a southerly direction to Burlington Road. At Burlington Road, the creek turns and begins flowing in a southwesterly direction towards Illinois State Route 47. After flowing under Illinois State Route 47, the ditch flows towards Illinois State Route 64 south of the Aeroview Airport in an east/southeasterly direction. South of Illinois State Route 64, Virgil Ditch Number 2 flows towards the south to its confluence with Union Ditch Number 3 just east of Meredith Road. There are two small unnamed tributaries to Virgil Ditch Number 2 located within the subwatershed.

Virgil Ditch Number 1 is located in the southeast corner of the Union Ditch subwatershed. Virgil Ditch Number 1's headwaters are located just northwest of Elburn northwest of the intersection of Illinois State Route 38 and Illinois State Route 47. From this point, the stream flows westward through agricultural fields. Approximately 2,500 feet west of Meredith Road, Virgil Ditch Number 1 turns to the north and flows in a northwesterly direction to its confluence with Union Ditch Number 3 just north of Beith Road and west of Thatcher Road.

Union Ditch Number 1 is located in the western portion of the Union Ditch subwatershed. The headwaters of Union Ditch are situated south of Cortland and Interstate 88 near the intersection of Somonauk Road and Gurler Road. The creek continues to flow in a northeasterly direction through agricultural fields and passing under Interstate 88 and Illinois State Route 38. Just north of Illinois State Route 38, Union Ditch Number 1 takes a slight bend to the north and then continues to flow to the north/northeast to its confluence with

Union Ditch Number 2 approximately 750 feet south of the intersection of Pleasant Street and Hartman Road.

The headwaters of Union Ditch Number 2 are located west of Howard Road and north of the railroad tracks. From its headwaters, the creek flows westward under the railroad tracks and through an agricultural area towards Maple Park. East of Maple Park, Union Ditch Number 2 bends towards the south for a short distance before turning to the west and heading into Maple Park. Through Maple Park, the stream flows on a northwest trajectory. Immediately north of the railroad tracks and Maple Park Road, Union Ditch Number 2 turns and flows northward for approximately 6,000 feet before bending to the west. From this point, Union Ditch Number 2 flows westward for approximately 4,700 feet to the confluence with Union Ditch Number 3. From the confluence of Union Ditch Number 2 and Union Ditch Number 3, the creek is known as the East Branch of the South Branch Kishwaukee River.

Union Ditch Number 3 is considered the main stem and is the receiving stream for the Virgil Ditch system, Union Ditch Number 1 and Union Ditch Number 2. The headwaters of Union Ditch Number 3 are located in the east central portion of the Union Ditch subwatershed, southwest of Lily Lake. The creek then flows eastward through agricultural fields. From east to west, the following tributaries flow into Union Ditch Number 3: Virgil Ditch Number 2, Virgil Ditch Number 3, Virgil Ditch Number 1, and Union Ditch Number 2. From the confluence of Union Ditch Number 2 and Union Ditch Number 3, the creek is known as the East Branch of the South Branch Kishwaukee River.

For planning purposes, streams in the subwatershed were divided into unique stream reaches. The reaches for the Union Ditch subwatershed are depicted in Figure 3-27.

East Branch South Branch Subwatershed

The East Branch South Branch Kishwaukee River subwatershed is located in the northwest portion of the watershed and is 37.85 square miles in size. The East Branch South Branch Kishwaukee River connects the Union and Virgil Ditches to the South Branch Kishwaukee River. From the confluence of Union Ditch Number 2 and Union Ditch Number 3, the East Branch South Branch Kishwaukee River flows northward running along the eastern side of the quarry. After passing the quarry, the river continues to run northward through an agricultural area towards Bethany Road. Just north of Bethany Road, the river takes a 90-degree bend and begins flowing westward to Airport Road. Approximately 2,500 feet west of Airport Road, the East Branch South Branch Kishwaukee River takes another 90-degree turn towards the north flowing towards Sycamore. The river flows through Sycamore Community Park, the Sycamore Gold Club, and the Sycamore Family Sports Center. Just north of Illinois State Route 64, the East Branch South Branch Kishwaukee River bends slightly to the west and the river flows in a west/northwest direction through the northern portion of Sycamore. The Sycamore Wastewater Treatment Plant discharges to the river approximately 1,500 feet west of Brickwell Road. After flowing through Sycamore, the East Branch South Branch Kishwaukee River continues to flow to the northwest through an agricultural area and south of the Anderson Airport to its confluence with the South Branch of the Kishwaukee River.

There are three main tributaries to the East Branch South Branch Kishwaukee River: Blue Heron Creek located north of Sycamore and two unnamed tributaries in the central portion of the subwatershed.

There is one impoundment located in the East Branch South Branch Kishwaukee River subwatershed: Lake Sycamore. Lake Sycamore is 7.5 acres and is owned and managed by the Sycamore Park District.

For planning purposes, streams in the subwatershed were divided into unique stream reaches. The reaches for the East Branch South Branch Kishwaukee River subwatershed are depicted in Figure 3-28.

3.13.4 Channel Conditions

A number of factors can be used to describe the condition of the East Branch South Branch Kishwaukee River watershed. The degree of hydromodification and channelization can be used to assess the health and condition of a river or stream.

Hydromodification

Hydromodification is a term that is used to describe human induced activities that change the dynamics of surface or subsurface flow. Historically, the most prevalent form of hydromodification was the draining of wetlands, construction of the ditches, and channelization of natural stream channels to increase agricultural production. Early settlers of the Midwest quickly realized that the soils found under wetlands and wet prairies were ideal for crop production once the water was removed. In order to "dry" the wetlands and the wet prairies, systems of sub-surface drainage tiles were installed in order to re-route the groundwater away from the wetlands and wet prairies and discharged into surface waters. Given that the drain tiles were drained by gravity flow, the receiving surface water needed to be a lower elevation than the tile. As such, naturalized stream channels were often excavated to a deeper depth and straightened to facilitate quicker drainage of the fields. Once the water was removed, these areas could be put into successful agricultural production. This creation of agricultural land was at the cost of the loss of wetlands, wet prairies, and riparian habitat. Hydromodification attributed to the installation of drain tiles is prevalent throughout the East Branch South Branch Kishwaukee River.

The likely extent of tile drainage in the East Branch South Branch Kishwaukee River is estimated here based on soil drainage class. NRCS recognizes seven natural drainage classes describing the frequency and duration of wet periods for various soils: Excessively Drained, Somewhat Excessively Drained, Well Drained, Somewhat Poorly Drained, Poorly Drained and Very Poorly Drained. The last three drainage classes indicate soils which limit or exclude crop growth unless artificially drained. Soils in the Somewhat Poorly Drained, Poorly Drained and Very Poorly Drained occur on approximately 40% of the land in the East Branch South Branch Kishwaukee River watershed. These areas can be taken as an approximation of the likely extent of artificial drainage on agricultural lands given that crop growth on these lands would be severely impacted or impossible without artificial drainage.

The short-term impact result of this type of hydromodification is localized flooding. Water that was once stored on land during wet periods now increasing filters into the underground tiles and flow quickly into ditches and streams causing the channel to experiences what is called "flashy" hydrology. "Flashy" hydrology means that the water level in the stream rises very quickly during a storm and falls quickly afterward. Since less water is infiltrating into the ground and constantly seeping out and creating a steady base flow within the stream, low flows are considerably lower. Likewise, because less water is absorbed by the ground and more water is flowing into the streams, high flows are considerably higher. High flows can result in damage to property of watershed residents, erosion, flooding, and pollution. Decreased or low flows degrade aquatic habitat because low flows have low levels of dissolved oxygen necessary for aquatic animals and because, in extreme cases, the stream can dry up completely for periods of time.

Over the long term, hydromodification will cause the ditch and stream channels to expand as a means of handling the higher flows. As the stream channel expands, the banks will erode and the bottom will become deeper. This deepening of the stream channel is called incision. The process of stream bank erosion and channel incision causes a significant amount of sediment to be generated within the stream and carried through the watershed and into the stream's receiving water. Channel incision also leads to a disconnect between the stream and its floodplain. Once separated, high flows that were once stored in the floodplain and slowly released back into the stream are forced to remain in the channel. These "trapped" flows have high velocities leading to additional streambank erosion and incision of the stream channel. It becomes a vicious pattern where with each rainfall event; the creek continues to erode adding additional sediments to the watershed and further preventing the creek to access the floodplain.

Channelization

Channelization is the practice of dredging and straightening stream channels to increase flow rates and carrying capacities. Traditionally, channelization was done to move as much water as possible away from an area in a short period of time and prevent flooding. The streams in the East Branch South Branch Kishwaukee River watershed were almost entirely channelized by the early 20th Century. According to the Report on the Natural Resources and Habitat in the Kishwaukee River Watershed published by the Kishwaukee River Ecosystem Partnership (KREP) in April 2004, the East Branch South Branch Kishwaukee River was once a meandering 4th order river that has almost entirely (98%) channelized and converted to an agricultural conveyance system. Many of the natural stream features have been destroyed through the elimination of the meandering bends and the over-widening of the channel bottom. Blue Heron Creek, a tributary north of downtown Sycamore, is the only steam in the subwatershed that has not been channelized and has natural stream features such as riffle-pools. However, it should be noted that development pressures in the Blue Heron Creek watershed is threatening water quality and habitat degradation and channel instability in the Blue Heron Creek catchment. According to the same report, the Union Ditch subwatershed is the number one most channelized subwatershed out of the 42 subwatersheds located in the Kishwaukee River basin and the Virgil Ditch subwatershed is one of the 10 most channelized subwatersheds in the 42 subwatersheds. Almost 100% of all streams in the Union Ditch watershed have been channelized and the stream channels are moderately to severely entrenched.

There are problems resulting from channelization of streams and ditches. Channelization is detrimental for the health of streams and rivers through the elimination of suitable instream habitat for fish and wildlife by limiting the number of natural instream features such as pool-riffle sequences in the channel. Channelization can also lead to the creation of excessive flows in the stream leading to hydromodification both within and downstream of the channelized areas. Additionally, in many locations, a berm comprised of historic side-cast dredge spoils cuts off the stream channels from the floodplain.

3.13.5 Hydraulic Structures

Hydraulic structures are categorized as bridges, culverts, levees, weirs, dams, fencing and any other human made structures located in or over the stream channel. The location and condition of hydraulic structures is a valuable piece of information as hydraulic structures may act as possible constrictions in conveying river flow, increase the potential for backwater flooding problems, and impede the movement of fish and other aquatic species up and down the stream. A hydraulic structure inventory was not conducted as part of the watershed-planning process.

Dams can serve as potential barriers to the movement and dispersal of aquatic organisms such as fish and may limit available habitat for breeding and feeding. There are no dams in the watershed.

3.13.6 Instream and Riparian Habitat Assessment

3.13.6.1 Illinois Natural History Survey and Illinois Department of Natural Resource Data

Fish Surveys

According to the Report on the Natural Resources and Habitat in the Kishwaukee River Watershed, fish were collected in the East Branch South Branch Kishwaukee River subwatershed in 1965, 1967, 1997, and 2001. Thirty two (32) species were documented in the watershed. Table 3-35 listed the documented fish species and if the species is pollutant intolerant.

Table 3-35 Documented Fish Species in the East Branch South Branch Kishwaukee River Subwatershed (IDNR)

Genus/species	Common Name	Date Last Collected	Pollution Intolerant
Etheostoma zonale	Banded darter		Yes
Notropis dorsalis	Bigmouth shiner	2001	
Ameriurus melas	Black bullhead	1965	
Percina maculata	Blackside darter	2001	
Lepomis macrochirus	Bluegill		
	Bluegill – green sunfish hybrid		
Pimephales notatus	Bluntnose minnow	2001	
Campostoma anomalum	Central stoneroller	2001	
Lexilus cornutus	Common shiner	2001	
Semotilus atromaculatus	Creek chub	2001	
Pimephales promelas	Fathead minnow	1997	
Moxostoma erythrurum	Golden redhorse	2001	
Lepomis cyanellus	Green sunfish	2001	
Nocomis biguttatus	Hornyhead chub	2001	
Ethepstoma exile	Iowa darter	1967	Yes
Ethepstoma nigrum	Johnny darter	2001	
Campostoma oligolepis	Largescale stoneroller	1997	Yes
Hypentelium nigricans	Northern hog sucker	2001	Yes

Genus/species	Common Name	Date Last Collected	Pollution Intolerant
Esox lucius	Northern pike	2001	
Carpiodes cyprinus	Quilback	2001	
Lythrurus umbratilis	Redfin shiner	1997	
Ambloplolites rupestris	Rock bass	2001	Yes
Notropis rubellus	Rosyface shiner	2001	Yes
Notropis ludibundus	Sand shiner	2001	
Moxostoma macrolepidotum	Shorthead redhorse	2001	Yes
Moxostoma anisurum	Silver redhorse	2001	Yes
Micropterus dolomieu	Smallmouth bass	2001	Yes
Phoxinus erythrogaster	Southern redbelly dace	2001	Yes
Cyprinelle spiloptera	Spotfin shiner	2001	Yes
Noturus flavus	Stonecat	2001	Yes
Catostomus commersoni	White sucker	2001	
Ameiurus natalis	Yellow bullhead	2001	

No fish survey information was available for the Union Ditch and Virgil Ditch subwatersheds.

Mussel Surveys

According to the Report on the Natural Resources and Habitat in the Kishwaukee River Watershed, mussels were collected in the East Branch South Branch Kishwaukee River subwatershed in 1999. Four (4) species were documented in the watershed. Table 3-36 listed the documented fish species and if the species is pollutant intolerant.

Table 3-36 Documented Mussel Species in the East Branch South Branch Kishwaukee River Subwatershed (IDNR)

Genus/species	Common Name	Date Last Collected
Pyganodon grandis	Giant floater	1999
Lasmigona compressa	Creek heelsplitter	1999
Lasmigona comlanata	White heelsplitter	1999
Anodontoides ferussacianus	Cylindrical papershell	1999

No mussel survey information was available for the Union Ditch and Virgil Ditch subwatersheds

Biological Stream Characterization Report

In November 1996, the Illinois EPA released a Biological Stream Characterization Report for the Virgil Ditch system. As part of the Biological Stream Characterization Report, Index of Biological Integrity (IBI) scores were calculated for Virgil Ditch Number 1, Virgil Ditch Number 2, and Virgil Ditch Number 3. The IBI index is designed to measure the aquatic vertebrate community and the surrounding conditions by using fish species as indicators. In the index there are 12 fish community variables that can be broken down into three main categories: species richness and composition, trophic composition, and fish abundance and condition. By assessing the variables within these parameters, scientists compare a sampled site with a relatively undisturbed site with similar geographical and climatic conditions. With this rationale, the only variable would be stressors resulting from human development and disturbance. The IBI scores are then used to give a stream rating to the assessed stream.

Table 3-37 listed the IBI and stream rating for the Virgil Ditch system.

Table 3-37 IBI and Stream Rating for the Virgil Ditch System (IDNR)

Stream	Survey Date	IBI Score	Stream Rating
Virgil Ditch Number 1	1988	40	C
Virgil Ditch Number 2	1988	38	C
Virgil Ditch Number 3	1988	42	B

Data indicated that at the time of the survey (15 years ago), the streams of the Virgil Ditch system were generally considered of moderate to high quality based on the biological diversity of fish pollutions recorded in the streams.

A request for additional data on instream and riparian habitat conditions was submitted to the Illinois Natural History Surevy and the Illinois Department of Natural Resources. This information was pending at the time of the report.

3.13.6.2 Data collected by DeKalb County

Birds

Based on data provided by DeKalb County, 207 species of birds have been seen within the vicinity of the DeKalb County portion of the East Branch South Branch Kishwaukee River watershed with in the last 10 years. A list of the observed species in included in Appendix B.

3.13.6.3 Data collected as part of the Watershed Planning Process

Northern Illinois University in coordination with the East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) Watershed Steering Committee (Watershed Steering Committee) conducted a stream inventory of the watershed as part of the development of this watershed-based plan. Habitat, biological, and/or water quality data was collected at 8 sites in the watershed. The sites and their location are listed in Table 3-38 and shown in Figure 3-29. Field data sheets for the sampling can be found in Appendix B.

Table 3-38 Data Collection Sites in East Branch South Branch Kishwaukee River Watershed

Site Name	Location	Date Sampled
East Branch of the South Branch Kishwaukee River	Near Motel Road	08/06/2013
Blue Heron Creek	Near Motel Road	08/09/2013
Union Ditch #1	Near Hartmann Road	08/14/2013
Union Ditch #2	Near Maple Park Road and railroad tracks	08/14/2013
Union Ditch #3	Near Airport Road	08/17/2013
Virgil Ditch #1	Near Thatcher Road	09/07/2013
Virgil Ditch #2	Near Welter Road	09/28/2013
Virgil Ditch #3	Near Winters Road	09/07/2013

Qualitative Habitat Evaluation Index (QHEI)

NIU used a modified qualitative habitat evaluation index (QHEI) to evaluate the stream condition in the watershed. The QHEI gives scientists a qualitative assessment of physical characteristics of a sampled stream similar to IBI biological data. QHEI represents a measure of instream geography. This comprehensive assessment is critical for evaluating disturbance and land use practices. There are six variables which comprise the QHEI (see Table 3-39). The QHEI scores for the sampled sites are included in Table 3-40.

Table 3-39 QHEI Components

Metric	Metric Component	Best Possible Score
Substrate	• Type • Quality	20
Instream Cover	• Type • Amount	20
Channel Morphology	• Sinuosity • Development • Channelization • Stability	20
Riparian Zone	• Width • Quality • Bank Erosion	10
Pool Quality	• Max Depth • Current • Morphology	12
Riffle Quality	• Depth • Substrate Stability • Substrate embeddedness	8
Map Gradient		10
	Total	100

Table 3-40 QHEI Scores for the Sampled Sites

Site	Substrate	Instream Cover	Channel Morphology	Riparian Zone	Pool Quality	Riffle Quality	Map Gradient	TOTAL
East Branch South Branch Kishwaukee River	6	7	14	10	1	4	2	44
Blue Heron Creek	0	10	12	7	-1	0	2	30
Union Ditch #1	15	8	12	6	1	4	2	48
Union Ditch #2	-2	9	14	9	-1	4	2	35
Union Ditch #3	-2	7	8	8	1	2	2	26
Virgil Ditch #1	8	13	8	7	-1	0	2	37

Site	Substrate	Instream Cover	Channel Morphology	Riparian Zone	Pool Quality	Riffle Quality	Map Gradient	TOTAL
Virgil Ditch #2	18	12	13	4	2	3	2	54
Virgil Ditch #3	20	10	14	7	-1	5	2	57

For communicating general habitat quality narrative categories have been assigned to QHEI scores. The narrative category by QHEI score is shown in Table 3-41. The narrative category for the samples sites is included in Table 3-42.

Table 3-41 Narrative Ranges Assigned to QHEI Scores

Narrative Rating	QHEI Score	
	Headwater Streams (<20 square mile tributary area)	Larger Streams
Excellent	>70	>70
Good	55-69	60-69
Fair	43-54	45-59
Poor	30-42	30-44
Very Poor	<30	<30

Table 3-42 Narrative Ranges for the Sampled Sites

Location	Score	Narrative Category
East Branch South Branch Kishwaukee River	44	Fair
Blue Heron Creek	30	Poor
Union Ditch #1	48	Fair
Union Ditch #2	35	Poor
Union Ditch #3	26	Very Poor
Virgil Ditch #1	37	Poor
Virgil Ditch #2	54	Good/Fair
Virgil Ditch #3	57	Good

More information on QHEI and how it is calculated can be found in *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)*, published by State of Ohio Environmental Protection Agency, Division of Surface Water in June 2006.

Macroinvertebrates

In each 200 foot stream segment, NIU collected aquatic macroinvertebrates. Aquatic macroinvertebrates, other than unioinid clams, were sampled qualitatively primarily using a triangular net (1 mm mesh). The aquatic vegetation in, and the overhanging vegetation along the sides of, the channel were swept repeatedly and systematically with the net. In the middle sections of the channel, the net was positioned vertically to the bottom of the substrate while the area just upstream of the net (~ 0.5 m2) was disturbed by kicking the substrate. All specimens collected with the net were sorted in a white enamel pan, identified, and then returned to the water. When present, larger rocks and submerged woody debris were removed and examined for macroinvertebrates. Macroinvertebrate data collected by NIU is summarized in Table 3-43.

Table 3-43 Macroinvertebrate Data Collected by NIU

Site	Observed	Species	Narrative Category
East Branch South Branch Kishwaukee River	Yes	Mayflies, Caddisflies, Damselflies, Snails, Amphipods, Leeches, Worms, Crayfish, Fingernail Clams, Simuliidae, Haliplidae, Frogs	Good
Blue Heron Creek	Yes	Mayflies, Dragonflies, Snails, Worms, Beetles	Poor
Union Ditch #1	Yes	Caddisflies, Damselflies, Snails, Amphipods, Isopods, Leeches, Worms, Hemiptera belostomatidae, pipuladae, back swimmer, water boatman, midge, chironomus	Good
Union Ditch #2	Yes	Mayflies, Dragonflies, Damselflies, Snails, Isopods, Beetles, Plankton, Corixid	Poor
Union Ditch #3	Yes	Mayflies, Caddisflies, Dragonflies, Damselflies, Snails, Amphipods, Worms, Beetles, Crayfish, Caddi-pupal Case, Pollywods in Myriophyllus, Zooplankton, Mosquito larva, Corixids	Fair
Virgil Ditch #1	Yes	Mayflies, Dragonflies, Damselflies, Snails, Amphipods, Worms, Beetles	Fair
Virgil Ditch #2	Yes	Dragonflies, Damselflies, Snails, Amphipods, Leeches, Beetles, Crayfish,	Fair
Virgil Ditch #3	Yes	Mayflies, Caddisflies, Dragonflies, Damselflies, Snails, Worms, Beetles, Crayfish	Good

Fish/Amphibians

Fish and amphibians were not sampled and collected as part of this assessment. Field staff anecdotally noted the presence of any small fish or amphibians observed during the collection of macroinvetrbrates. Fish and amphibian species noted by NIU are included in Table 3-44.

Table 3-44 Fish and Amphibians Noted by NIU

Site	Observed	Species	Narrative Category
East Branch South Branch Kishwaukee River	Yes	Minnow, Frogs	Present
Blue Heron Creek	Yes		Present
Union Ditch #1	None		None
Union Ditch #2	Yes	Fish larva	Present
Union Ditch #3	Yes		Present
Virgil Ditch #1	Yes		Present
Virgil Ditch #2	Yes		Present
Virgil Ditch #3	Yes		Present

Unionid clams/ Mussel Beds

A team of NIU investigators also sampled unionid clams in each of the 200 ft. sampling reaches. The NIU investigators systematically probed the substrate across the breadth of the channel as they moved in unison upstream. The number of live clams collected in each 10 ft. section was recorded. All live clams collected were immediately placed back in the stream sediments. Sampling for clams preceded the collection of other macroinvertebrates. Unuionid clams/mussel bed data collected by NIU is summarized in Table 3-45.

Table 3-45 Unuionid Clams/Mussel Bed Data Collected by NIU

Site	Observed	Field Notes	Narrative Category
East Branch South Branch Kishwaukee River	Yes	19 beds observed	Good
Blue Heron Creek	None	Found 10 dead shells	None
Union Ditch #1	None		None
Union Ditch #2	No survey conducted		
Union Ditch #3	Yes	31 beds observed	Good
Virgil Ditch #1	No survey conducted		
Virgil Ditch #2	None		None
Virgil Ditch #3	Yes	12 beds observed	Poor

Water Quality

NIU conducted a water quality sampling at the 8 sampling sites in the East Branch South Branch Kishwaukee River watershed. See Section 3.14.2 for additional information on the water quality sampling conducted by NIU.

3.14 Water Quality

Water quality is impacted by pollutants from a number of point and non-point sources. Point sources are discharges from a single source such as a pipe conveying wastewater from a wastewater treatment facility into the stream. Nonpoint sources contribute pollutants to the water system from across the landscape including runoff from yards, rooftops, roads, parking lots, and other urban and nonurban surfaces. During storms, pollutants on the landscape are washed from the ground and impervious surfaces into storm sewers and roadside drainage ditches, and ultimately into the East Branch South Branch Kishwaukee River stream system. Physical changes in the watershed, such as hydromodification, channelization and the loss of riparian vegetation and wetlands, also impact water quality and aquatic habitat.

The causes and sources of water quality problems in the East Branch South Branch Kishwaukee River watershed are urban in nature. These problems are the result of many years of modification of the watershed landscape as it changed from natural to agricultural to urban. These changes have included modification of the stream channel, floodplain, and wetlands. Other changes are the result of the increased watershed impervious cover that has led to an increase in the volume and rate of runoff in the watershed. The increased quantity of runoff has caused problems such as excessive stream bank erosion and the deepening of the stream channel due to channel erosion. In addition to increasing surface runoff, impervious surfaces reduce the amount of rainwater that infiltrates into the ground to recharge groundwater sources.

3.14.1 State of Illinois Reporting

Surface water quality monitoring is used by limnologists and scientists to evaluate the ecological health of a waterbody. The overall objective for water quality sampling is to assess the existing conditions of a stream, river or lake in an attempt to restore or maintain the chemical, physical, and biological integrity of the monitored surface water. In Illinois, the Illinois EPA utilizes water quality monitoring data as its major source of information for the Illinois EPA Section 305(b) and Section 303(d) List integrated report. Section 303(b) of the Federal Clean Water Act required each state to submit to the USEPA a biannual report of the quality of the state's surface and groundwater resources. The 305(b) report includes a detailed description of the how Illinois assesses water quality and whether the assessed waters meet or do not meet "Designated Uses". When a waterbody is determined to be impaired, Illinois must list the potential reasons for the impairment in the Section 303(d) impaired waters list.

Section 303(d) of the Clean Water Act requires Illinois to submit to the USEPA a list of waterbodies with impaired uses, the pollutant causing the impairment, and a priority ranking for the development of Total Maximum Daily Loads (TMDLs). The establishment of the TMDL sets the pollution reduction goal to improve the impaired waters. Historically, the 305(b) list and the 303(d) list were submitted to the USEPA as separate documents, however, since 2006, the reports have been integrated into a single report.

The surface water assessments included in the 2012 Illinois Integrated Water Quality Report and Section 303(d) List are based on data obtained through chemical, physical, and biological sampling. These assessments help protect "Designated Uses" by setting water quality standards that will protect the designated uses. In Illinois, the "designated uses" for surface waters include: aquatic life, indigenous aquatic life, fish consumption, primary contact, secondary contact, water supply and aesthetic quality. For each "designated use", it is determined if a waterbody is either "fully supporting" or "not supporting" the use based on the available data and any waters that are determined to be not supporting a designated use are considered impaired. Additionally, the USEPA required that the assessed waters be placed into categories based on their attainment (Table 3-44). Category 5 waters comprise the Illinois 303 (d) list. The 303(d) listed waters are prioritized by the Illinois EPA and TMDLs are prepared for waters in the order of priority (highest to lowest).

Table 3-46 Categorization of 303(d) Listed Waters

Category	Sub-Category	Description
1		All designated uses are assessed as fully supporting and no use is threatened (Note- Illinois does not assess any waters as threatened).
2		Available data and/or information indicate that some but not all designated uses are supported
3		Insufficient data and/or information to make a use support determine for any use
4		Waterbodies contain at least one impaired use but TMDL is not required. Category 4 is subdivided as listed below based on the reason a TMDL is not required.
	a	TMDL has been approved or established by the USEPA.
	b	Technology based effluent limitations required by the Clean Water Act, more stringent effluent limits required by the state, local, or federal authority, or other pollution control requirements required by state, local or federal authority are stringent enough to implement applicable water quality standards within a reasonable period of time
	c	Failure to meet the applicable water quality standards is not caused but a pollutant but other types of pollution (such as aquatic life impairment due to habitat degradation)
5		Available data and/or information indicate that at least one designated use is impaired and a TMDL is required.

According to the 2012 Integrated Water Quality Report and Section 303(d) list, 7.17 miles of the East Branch South Branch Kishwaukee River (Segment IL_PQCL-02) was assessed for aquatic life by the IEPA. As of the 2012 303(d) list, this segment of the East Branch South Branch Kishwaukee River was fully supporting its aquatic life use. No other uses (fish consumption, primary contact, secondary contact or aesthetic quality) of the East Branch South Branch Kishwaukee River were assessed by the IEPA. Additionally, no use assessment was conducted for any waters within the East Branch South Branch Kishwaukee River, Virgil Ditch, and Union Ditch subwatershed.

According to the 2012 Integrated Water Quality Report and Section 303(d) list, Lake Sycamore is listed on the 303(d) List as not supporting fish consumption use due to elevated levels of polychlorinated bi-phenyls (PCBs) from an unknown source. No other uses (fish consumption, primary contact, secondary contact or aesthetic quality) of Lake Sycamore were assessed by the IEPA.

A request for the data utilized by the IEPA to make the use assessment determinations for the East Branch South Branch Kishwaukee River and Lake Sycamore was submitted. However, at the time of this report, this information was pending.

3.14.2 Available Chemical and Physical Water Quality Monitoring

Typically, chemical and physical water quality monitoring includes the collection of water quality samples that are analyzed for the following parameters:

- Temperature
- pH
- Dissolved oxygen (DO)

- Conductivity
- Total suspended solids (TSS)
- Total dissolved solids (TDS)
- Metals including cadmium, chromium, copper, iron, lead, manganese, mercury, silver, and zinc
- Nitrogen including nitrite, nitrate, and total nitrogen
- Phosphorus including dissolved phosphorus and total phosphorus
- Bacteria
- Chlorides

There is no known water quality data available for East Branch South Branch Kishwaukee River watershed collected by any local, state, or Federal agency. But it appears that the IEPA may have collected data within the watershed as both the East Branch South Branch Kishwaukee River and Lake Sycamore have been assessed as part of the development of the 2012 Integrated Water Quality Report and Section 303(d) list. A request for the data collected by the IEPA for the East Branch South Branch Kishwaukee River and Lake Sycamore was submitted. However, at the time of this report, this information was pending. A request for additional data has also been submitted to the DeKalb County Health Department for information on water quality sampling in Lake Sycamore. This information is also pending.

Northern Illinois University in coordination with the East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) Watershed Steering Committee (Watershed Steering Committee) conducted a stream inventory of the watershed as part of the development of this watershed-based plan. As part of the stream inventory, water quality data was collected at 8 sites within the watershed. At each sampling location, water samples were collected for water quality analysis at the half way point of each sampling location. Samples were collected before any other activities occurred in the waterway upgradient from the location. Turbidity using a turbidimeter was used directly from the river. Sampling consisted of rinsing a bucket three times with water from the river and then filling it to 2 gallon point. Water was then tested on the river banks. A multiprobe meter (HACH HQ probe) was used to determine temperature, pH, and conductivity immediately after sampling. HACH tests kits were run for nitrate, nitrite, phosphate, sulfate, sulfide, and ammonia next. See Table 3-38 and Figure 3-25 for information regarding the location of the sampling sites. Table 3-47 details the results of the water quality sampling.

Table 3-47 NIU Water Quality Sampling Results for the East Branch South Branch Kishwaukee River Watershed

Site	Temp	Conductivity	pH	Nitrate	Nitrite	Ammonia	Ortho Phosphate	Sulfide	Sulfate	Turbidity	Color	Water Clarity	Aesthetic
Detection Limit	0-60	0.01 µS/cm to 200.0 mS/cm	1-14	8	0.05	0.03	0.03	<0.1	1	1	N/A	N/A	N/A
Units	°C	µS/cm	N/A	mg/L						NTU	N/A	Inch	N/A
East Branch South Branch Kishwaukee River	NR	598	7.5	110	NR	1.75	1.62	<0.1	82	21	Brown	<6	N/A
Blue Heron Creek	19.6	686	7.07	41	0.22	2.37	0.54	0.2	<1	19	Clear	6-12	Trash/ litter
Union Ditch #1	14.1	785	8.6	49	0.16	2.9	1.07	0.1	26	13	Clear	<6	N/A
Union Ditch #2	16.4	850	7.65	18	0.11	>5.8	1.34	0.1	<1	135	Clear	<6	Oil sheen, nuisance odor
Union Ditch #3	20	715	7.94	<8	<0.05	<0.03	0.6	<0.1	82	4	NR	NR	
Virgil Ditch #1	24	NR	8.04	NR	<0.05	0.21	1.89	0.1	71	12	Clear	NR	Minimal trash / litter
Virgil Ditch #2	15.3	718	5.81	117	0.05	1.51	0.85	0.1	73	6	Clear	6-12	Nuisance odor
Virgil Ditch #3	19.8	NR	7.64	<8	0.98	1.59	0.56	0.4	92	13	Clear	6	Trash / Litter

NR= Not Reported
N/A = Not Applicable

Temperature

Water temperatures fluctuated with daily air temperatures as well as with seasonal changes, i.e., water temperatures are higher in summer and cooler in spring and fall. Maximum water temperatures over 20°C may preclude most fish from using these streams for habitat.

Conductivity

Specific conductivity indirectly measures the concentration of chemical ions or dissolved salts in the water, and may be an indicator of salt as a pollutant. The more chemical ions or dissolved salts a body of water contains, the higher the conductivity will be. Conductivity levels of 200-1,000 µS/cm are indicative of normal background levels. Conductivity outside of this range may not be suitable for certain species of fish or bugs. High conductivity (1000 to 10,000 µS/cm) is an indicator of saline conditions. High chloride concentrations following salt applications for snow melting in winter can lead to high conductivity readings, as can the leaching of effluent from a sanitary sewer line into a stream. Low water levels tend to increase concentrations of ions in the water column, while rain events tended to temporarily flush ions out of the stream system.

pH

Normal pH (a measure of hydrogen ions in the water) values in streams should range from 6.5 to 8.5, good conditions for aquatic life.

Nitrogen

Nitrogen can be found in several different forms in terrestrial and aquatic ecosystems. These forms of nitrogen include ammonia (NH3), nitrates (NO3), and nitrites (NO2). Nitrogen is an essential plant nutrient, but in excess amounts it can cause significant water quality problems. Together with phosphorus, nitrogen in excess amounts can accelerate eutrophication, causing dramatic increases in aquatic plant growth (for example algae blooms) and changes in the types of plants and animals that live in stream and lakes. The increase in aquatic plant growth, in turn, affects dissolved oxygen (DO), temperature, and other indicators. Excess ammonia (NH3), nitrates (NO3), and nitrites (NO2) can cause hypoxia (low levels of dissolved oxygen) and can become toxic to warm-blooded animals at high concentrations under certain conditions. Nitrate levels above 10 mg/L are above drinking water guidelines. The natural level of ammonia or nitrate in surface water is typically low (less than 1 mg/L).

Sources of nitrates include wastewater treatment plants, runoff from fertilized lawns and cropland, failing on-site septic systems, runoff from animal manure storage areas, and industrial discharges that contain corrosion inhibitors.

Phosphate

Similar to nitrogen, phosphorus is an essential nutrient for the plants and animals that make up the aquatic food web. Since phosphorus is the nutrient in short supply (limiting nutrient) in most fresh waters, even a modest increase in phosphorus can, under the right conditions, set off a whole chain of undesirable events in a stream including accelerated plant growth, algae blooms, low dissolved oxygen, and the death of certain fish, invertebrates, and other aquatic animals.

Pure, "elemental" phosphorus (P) is rarely found in nature. Typically, phosphorus exists as part of a phosphate molecule (PO_4). Phosphorus in aquatic systems occurs as organic phosphate and inorganic phosphate. Organic phosphate consists of a phosphate molecule associated with a carbon-based molecule, as in plant or animal tissue. Phosphate that is not associated with organic material is inorganic. Inorganic phosphorus is the form required by plants. Animals can use either organic or inorganic phosphate. Both organic and inorganic phosphorus can either be dissolved in the water or suspended (attached to particles in the water column).

There are many sources of phosphorus, both natural and human. These include soil and rocks, wastewater treatment plants, runoff from fertilized lawns and cropland, failing septic systems, runoff from animal manure storage areas, disturbed land areas, drained wetlands, water treatment, and commercial cleaning preparations.

Sulfide

Water containing hydrogen sulfide, commonly called sulfur water, has a distinctive "rotten egg" or swampy odor. Hydrogen sulfide is a gas formed by the decay of organic matter such as plant material. It is typically found in groundwater containing low levels of dissolved oxygen and a pH less than 6.0. If the pH range of the water is higher (7.0-12.0), the water may contain other forms of sulfur (sulfide or bisulfide). Sulfur problems occur less frequently in surface waters because flowing water is aerated naturally so that the hydrogen sulfide reacts with oxygen and escapes as a gas or settles as a solid.

Hydrogen sulfide is not regulated by drinking water standards as it is considered a nuisance chemical and does not pose a health risk at concentrations typically present in household water. Concentrations high enough to be a health risk also make the water unpalatable. Conversely, concentrations as low as 0.5 milligrams per liter (mg/L) can add objectionable taste and a rotten egg odor to drinking water.

Sulfate

Similarly to nitrogen and phosphorus, sulfate is an essential nutrient for tissue growth in plants and animals. However, at higher concentrations sulfate can contribute to detrimental conditions in aquatic habitat. At higher concentrations, sulfate can encourage the release of metals from streambed sediments, thereby increasing stream alkalinity, which can adversely affect aquatic organisms that have low tolerance level for high pH.

Sources of sulfate in surface water can be derived from natural processes and anthropogenic (originating from human activity) activities. Natural sources of sulfate include weathering of rocks, dry deposition from the atmosphere, and precipitation. Anthropogenic sources of sulfate include: combustion of fossil fuels; industrial byproducts such as cement, steel mill slag; and crushed limestone (commonly used in parking lots and road construction). The combustion of fossil fuels accounts for the majority of sulfur in the atmosphere, which can return to the surface as sulfate through precipitation or dry deposition.

Turbidity

Turbidity, a measurement of the ‘cloudiness’ of water, is caused by suspended particles, or TSS (total suspended solids). Suspended materials include soil particles (clay, silt, and sand), algae, plankton, microbes, and other substances. Higher turbidity increases water temperatures because suspended particles absorb more heat. This, in turn, reduces the concentration of dissolved oxygen (DO) because warm water holds less DO than cold. Higher turbidity also reduces the amount of light penetrating the water, which reduces photosynthesis and the production of DO. Suspended materials can clog fish gills, reducing resistance to disease in fish, lowering growth rates, and affecting egg and larval development. As the particles settle, they can blanket the stream bottom, especially in slower waters, and smother fish eggs and benthic macroinvertebrates.

Sources of turbidity include: soil erosion; waste discharge; urban runoff; eroding stream banks; large numbers of bottom feeders (such as carp), which stir up bottom sediments; and excessive algal growth. Turbidity tends to increase after rain events when runoff carries particles into the stream, when high flows erode streambanks and/or the streambed, and when the increased volume of water in the channel stirs the sediment in the bottom of the channel.

Dissolved Oxygen

Algae and aquatic plants in the creek elevate dissolved oxygen (DO) concentrations during the day (due to photosynthesis) and lower DO concentrations at night (due to respiration). Low DO conditions typically exist in mid to late summer when air and water temperatures are high and water levels are low. DO concentrations below the Illinois Environmental Protection Agency standard of 5.0 mg/L can stress many fish species, and concentrations below 1.0 mg/L (hypoxic conditions) can be detrimental to aquatic life.

3.14.3 Illinois EPA Permit Programs

The Illinois Environmental Protection Agency (Illinois EPA) Bureau of Water regulates wastewater discharges through the implementation of the National Pollution Discharge Elimination System (NPDES) program. This program was imitated under the Clean Water Act to reduce pollution to surface waters and required permits be issued for the discharge of: 1) treated municipal effluent; 2) treated industrial effluent; and 3) stormwater from separate storm sewer systems (MS4s) and construction sites.

NPDES Point Source Discharges for Municipal and Industrial Effluent

Point sources of pollution are discharges from a single source such as a pipe conveying wastewater from an industrial process or a wastewater treatment facility into the stream. There are no municipal wastewater treatment plants discharging to the East Branch South Branch Kishwaukee River watershed. There are 9 NPDES point source industrial permits issued in the watershed: Central High School, DeKalb County Packing Company, Evergreen Mobile Home Park, Maple Park Sewage Treatment Plant, Larson Quarry, Suter Company, Sycamore Sewage Treatment Plant and Vulcan Materials Company. The locations of the NPDES Discharges are shown in Figure 3-30.

Table 3-48 provides additional information on these NPDES point source dischargers.

Table 3-48 NPDES Point Source Dischargers

Name	Description	NPDES Permit Number	Permit Status	Receiving Water
Central High School Burlington, Illinois	Sewage treatment plant	IL0049832	Active	Kishwaukee River
DeKalb County Packing Company Cortland, Illinois	Meat packing plant	IL0049832	Active	Unnamed tributary to the Kishwaukee River
Evergreen Village Mobile Home Park Sycamore, Illinois	Sewage treatment plant	IL0036811	Active	E Branch S Branch Kishwaukee River
Maple Park Sewage Treatment Plant Maple Park, Illinois	Sewage treatment plant	IL0070131	Active	Union Ditch #2
Larson Quarry (operated by Vulcan Materials) Sycamore, Illinois	Crushed and broken limestone	IL0003786	Active	E Branch S Branch Kishwaukee River
Maple Park Sewage Treatment Plan Maple Park, Illinois	Sewage treatment plant	ILG580261	Active	Union Ditch #2
Suter Company Sycamore, Illinois	Poultry Processing	IL0060828	Active	Martins Ditch (tributary to E Branch S Branch Kishwaukee River)
Sycamore North Sewage Treatment Plant Sycamore, Illinois	Sewage treatment plant	IL0031291	Active	E Branch S Branch Kishwaukee River
Vulcan Materials Company Sycamore, Illinois	Crushed and broken limestone	IL0068110	Active	E Branch S Branch Kishwaukee River

NPDES Stormwater Regulations

Stormwater runoff is a major source of pollution to the East Branch South Branch Kishwaukee River watershed. Stormwater runoff includes rainwater and snow melt that flows off the land into storm sewers or directly into lakes, rivers, or streams. Stormwater runoff can carry a wide range of pollutants including sediment, nutrients, metals, chlorides, and petroleum. Additionally, as the runoff flows over land, it can lead to increased erosion of exposed soils, especially on construction sites.

In order to reduce the impacts of stormwater on our rivers, streams and lakes, Illinois has been implementing stormwater regulations since 1990 through the NPDES program. The regulations have been implemented in two phases: Phase I and Phase II. Phase I began in 1990 and required large and medium-size cities with populations over 100,000 to obtain an NPDES permit coverage for their municipal separate storm sewer system (MS4). Phase I also required NPDES permits for ten industrial uses and for construction sites disturbing 5 acres or more of land.

The NPDES Phase II program began in 2003 and was an update to the 1990 Phase I program. The Phase II program expanded the program by including additional MS4 categories, providing a "no exposure" exemption to certain industrial facilities if activities are protected by a storm-resistant shelter to prevent the exposure of runoff and material from leaving the facility, and decreasing the threshold for a construction site permit to 1 acre or more of land disturbing activity.

MS4 Permits

The following governmental entities with the East Branch South Branch Kishwaukee River watershed are designated as MS4 communities: Campton Township, Town of Cortland, Cortland Township, DeKalb County, DeKalb Township, Village of Elburn, Kane County, Village of Lily Lake, Mayfield Township, Plato Township, City of Sycamore, and Sycamore Township. The Phase II communities all operate under a General Permit for Discharges from Small MS4s (Illinois EPA Permit Number ILR40).

The MS4 communities are required to complete a series of Best Management Practices (BMPs) including 1) Develop a stormwater management program consisting of BMPs and measurable goals for at least 6 control measures: 1) public education and outreach on stormwater impacts; 2) public involvement; 3) illicit discharge detection and elimination; 4) construction site stormwater runoff control; 5) post-construction stormwater runoff control in new developments; and 6) pollution prevention/good housekeeping for municipal operations. In addition to the six control measures, the MS4s must also submit a Notice of Intent (NOI) and an annual report of activities related to the permit to the Illinois EPA.

Construction Permits

As discussed above, NPDES Phase II Stormwater Regulations were implemented by the Illinois EPA in 2003 to address potential erosion from construction including commercial, residential, road building, and demolition sites in the state that disturb more than one acre of land. Land disturbance is defined as exposing soil during clearing, grading, or excavation. The regulations specifically require the operator (person with operational control of the day to day construction activities) of the property to ensure compliance with the permit conditions outlined in the Illinois Construction Site General Permit (ILR10). These requirements include submitting a Notice of Intent (NOI) to begin construction, create a Stormwater Pollution Prevent Plan (SWPPP) to control erosion during construction, and submit a Notice of Termination (NOT) when the site is permanently stabilized. The regulations also require that the construction site be inspected every 7 days and after every 0.5-inch or greater rainfall event or equivalent snowfall by a qualified inspector. During the weekly inspection, existing soil erosion and sediment control (SESC) practices are inspected for needed repairs. Additionally, the inspections are used to identify additional potential sources of erosion and sedimentation and make recommendations for additional SESC control practices. If construction activities result in an off-site discharge of sediment bearing waters, the operator is required to submit a Incident of Non-compliance (ION) to the Illinois EPA and provide a plan to prevent further releases of sediment.

The counties and municipalities also have soil erosion and sediment control ordinances that are aimed at reducing the potential for sediment from construction activities for negatively impacting the East Branch South Branch Kishwaukee River watershed.

3.14.4 Nonpoint Source Pollution

When rain flows across the landscape, pollutants such as oil and grease, road salt, eroding soil and sediment, metals, bacteria from pet wastes, and excess nutrients (nitrogen and phosphorus) from fertilizers are washed from streets, buildings, parking lots, construction sites, lawns and golf courses into the streams. This kind of pollution is called nonpoint source pollution, because it comes from the entire watershed rather than a single point, plant, or facility. These pollutants accumulate as the water flows downstream and eventually begin to degrade the quality of East Branch South Branch Kishwaukee River for aquatic life, as well as for human uses such as fishing, wading, and bird watching. In this way, every small bit of pollution adds up to a very large problem.

In addition to chemicals and other substances picked up from the landscape, non point source pollution includes other measures such as temperature, acidity, and the amount of oxygen in the water. Aquatic organisms including fish and benthic macroinvertebrates that are critical links in the food chain, need oxygen that is dissolved in the water to breathe. Low flows and nonpoint source pollution can cause the dissolved oxygen levels in the water to fall below healthy levels. When this happens, some plants and animals will die, in some cases causing fish kills, and others will leave that location to try to find cleaner water.

Water temperature can also cause problems. Many fish and other aquatic animals require cool or cold flowing water to survive. As rainwater flows across urban surfaces and through the sewer system, these surfaces warm the water causing the overall temperature of the receiving stream to be too warm for many aquatic plants and animals. This water can also be either more acidic (low pH) or more alkaline (high pH) than is healthy for these organisms to survive.

Sanitary Sewer System

The Sycamore Sewage Treatment Plant and Maple Park Sewage Treatment Plant discharges treated wastewater in the East Branch South Branch Kishwaukee River watershed. These discharges are point sources of pollution covered by the NPDES point source permitting process discussed in Section 3.11. However, non-point source pollution also can be traced to issues (cross connections with the storm sewer system, leakage into or out of the sanitary sewer system, overflows of the sanitary sewer system due to stormwater infiltration or combined sewers) within the sanitary or sewer system. The following are known about the Sycamore and Maple Park systems:

- No known cross connections exist between the sanitary system and the storm sewer system within the East Branch South Branch Kishwaukee River watershed that could result in sanitary discharge into the storm sewers.
- There are no combined sewers within these watersheds
- There are no overflow structures discharging into the waters of the watershed.

Additional sanitary sewer systems provide services to the Village of Campton Hills and Cortland. However, the discharges for these sanitary sewer systems are located outside the watershed.

Septic Systems

Several areas in the East Branch South Branch Kishwaukee River watershed are serviced by septic systems. Areas not serviced by sanitary sewer are assumed to be on septic systems.

Septic systems have the potential to discharge nutrients (phosphorus and nitrogen) and bacteria and virus in to the surface and groundwater of the East Branch South Branch Kishwaukee River watershed. When properly designed and maintained, the quantity of pollution discharge from the septic systems is limited. However, failing septic systems have the potential to be a significant cause of surface water and groundwater quality degradation. Additionally, it has been noted that straight-pipe septic systems can be found across the watershed. "Straight-piping" occurs when there is no in-ground treatment (septic system) of the sewage and instead the raw sewage is pumped directly to a stream. In the East Branch South Branch Kishwaukee River watershed, drain tiles are often used to deliver the untreated, raw sewage from homes to the creeks. Straight pipes have been illegal since the passage of the Clean Water Act in 1972, however, they can still be found in the old farmsteads in the watershed. Both failed septic systems and drain pipes can cause significant water quality degradation by introducing high levels of bacteria and nutrients into surface waters.

Nonpoint Point Source Pollutant Load Analysis

As a means of quantifying non-point source pollution loading in the watershed, a Pollutant Loading (PLOAD) application model for the East Branch South Branch Kishwaukee River watershed was developed. PLOAD is an extension of the comprehensive modeling tools in the Environmental Protection Agency's (EPA) Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) model. PLOAD is a GIS-based model that estimates nonpoint-source and point-source loadings on an annual average basis for small urban watersheds.

Hey has selected PLOAD as the nutrient loading modeling application that is the most appropriate for the East Branch South Branch Kishwaukee River watershed for the following reasons:

Transferability	PLOAD was designed to be utilized in a wide range of applications and uses including NPDES stormwater permitting, watershed management, watershed planning, and lake/reservoir protection projects. PLOAD is applicable for both small urban and rural watersheds of any size. The model inputs include GIS coverages of land use, subbasin boundaries, and BMP locations along with look-up tables for pollutant event mean concentrations (EMCs), imperviousness and BMP removal efficiencies. Additionally, as PLOAD is an extension of the BASINS model, the model can be downloaded for free from the Illinois EPA on the BASINS homepage. As such it is not cost prohibitive for even the smallest watershed planning organizations.
Applicability	PLOAD has the ability to estimate the importance of pollution contributions from multiple land uses and many individual sources in a watershed. Thus, it can be used to

target important areas of pollution generation and identify areas best suited for controls within a watershed. Once these "hot spots" are identified, PLOAD can then be utilized to evaluate the effectiveness that various types and locations of BMPs within the "hot spots" on pollutant loading.

PLOAD also has the ability to assess seasonal or inter-annual variability of nonpoint-source pollution and to assess long-term water quality trends. It can also be used to address land use patterns and landscape configurations in the watershed. This allows for the user to evaluate changes in pollutant loading that may occur as the result of future, predicted land use conditions.

Ease of Use

PLOAD has a user-friendly interface. Starting a new project within the BASINS platform involves an easy to follow step-by-step process. Once a project is started in BASINS, the gathering of background data necessary to run the PLOAD model can begin. After the initial background data is loaded into the model (land use, elevation and hydrology information, watershed boundaries, etc.) the PLOAD model plug-in can be utilized. The PLOAD model plug-in incorporates another step-by-step process where land use, precipitation, event mean concentration, BMPs, point sources, and bank erosion can either be referenced to BASINS or inserted manually where applicable for the particular project or area being analyzed. Manual insertion of the data is clearly detailed within the software instructions.

After modeling is complete, PLOAD gives its user the ability to generate out-puts as user-defined formats. This enables the user to tailor the output data they need. If so desired, the user can view the data from BASINS and PLOAD in ArcGIS if that software is installed on the computer being utilized.

Customizable

PLOAD's organization and structure facilitates modification and customization. By using look-up tables for EMCs, imperviousness terrain factor, and BMP removal efficiencies, PLOAD gives the user the opportunity to integrate site and region specific data on loading and removal rates into the model. This allows for a more refined calculation of loading and reduction rates.

Pollutants evaluated using PLOAD included

- Total Suspended Solids (TSS)
- Total Dissolved Solids (TDS)
- Biological Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)

- Total Phosphorus (TP)
- Total Nitrogen (TN)
- Nitrate-Nitrite (NO3-NO2)
- Total Kjeldahl Nitrogen (TKN)
- Lead
- Copper
- Cadmium
- Chromium
- Nickel
- Zinc

The model estimated pollutant loading of each pollutant from each subwastershed management unit (SMU). The modeled values were compared to the Illinois Environmental Protection Agency (Illinois EPA) Water Quality Standards for General Use, Secondary Contact, and Aquatic Life. The Illinois EPA Water Quality Standards used for this assessment are included in Table 3-49.

Table 3-49 Illinois EPA Water Quality Standards

Pollutant	**Illinois EPA Standards**
TSS	750 ppm
TDS	1,500 mg/L
BOD	5.0 mg/L
COD	30 mg/L
Total Phosphorus*	0.05 mg/L
Total Nitrogen (TN)	15 mg/L
Nitrate – Nitrite (NO3-NO2)	Not applicable
Total Kjeldahl Nitrogen (TKN)	10 mg/L
Lead (Pb)	0.1 mg/L
Copper (Cu)	1.0 mg/L
Cadmium (Cd)	0.15 mg/L
Chromium (Cr)	0.3 mg/L
Nickel (Ni)	1.0 mg/L
Zinc (Zn)	1.0 mg/L

* Applicable only to lakes/reservoirs and streams at its confluence with a lake/reservoir

Four pollutants in particular (TSS, TP, COD, and BOD) are considered as pollution indicators for this watershed. TSS and TP are typical indicators of urban pollutant loadings. TSS can lead to excessive sedimentation in stream reaches and ultimately cover and impair instream habitat. TP can lead to excessive productivity levels of aquatic plants in slow moving reaches and in wetlands. This can then lead to low DO levels as the plant material decays Low DO levels make the stream uninhabitable for some species of aquatic life. Since COD and BOD represent oxygen demanding substances they were included in the list of indicator pollutants for this watershed.

The pollutant loading results were used to identify and prioritize SMUs by their respective degree of pollutant loading. Table 3-50 details the pollution loading estimates from each subwatershed on a concentration basis (mg/L). Table 3-51 includes pollutant load calculations in pounds per year for each subbasin. Table 3-52 lists pollutant load in pounds per year for each land use.

The loading calculations were used to establish a ranking system for each of the modeled pollutants in order to identify priority watersheds. The rankings included “High” for those pollutants that exceeded the Illinois EPA standard, “Medium” for those pollutants that were under the Illinois EPA standard but at least half their value, and “Low” for those pollutants that were less than half of the Illinois EPA standard. Table 3-53 lists the Illinois EPA standards by pollutant and those subwatersheds exhibiting High, Medium, and Low levels for each pollutant.

Table 3-50 Estimated Pollutant Loading by Subwatershed in the East Branch of the South Branch Kishwaukee River watershed (mg/L)

SMU	Area (square mile)	TSS	TDS	BOD	COD	TP	PO_4	TN	NO_3	NO_2/NO_3	TKN	ORGN	NH_4	Pb	Cu	Cd	Cr	Ni	Zinc	Hg
East Branch of the South Branch Kishwaukee River Subwatershed																				
EBKR-1	0.02	1216.41	84.49	5.00	37.93	0.20	0.10	1.00	0.10	0.50	0.70	0.20	0.10	0.00710	0.00303	0.00152	0.00203	0.00203	0.03035	0.00303
EBKR-2	3.73	232.92	53.49	14.27	48.31	0.48	0.19	1.93	0.19	0.96	1.44	0.39	0.19	0.01886	0.00943	0.00471	0.00750	0.00750	0.09427	0.00943
EBKR-3	1.58	261.29	53.98	14.12	48.16	0.47	0.19	1.91	0.19	0.96	1.43	0.38	0.19	0.01867	0.00932	0.00466	0.00741	0.00741	0.09323	0.00932
EBKR-4	3.62	295.76	55.96	13.79	47.05	0.46	0.19	1.88	0.19	0.94	1.40	0.38	0.19	0.01809	0.00904	0.00452	0.00716	0.00716	0.09040	0.00904
EBKR-5	5.75	883.32	83.44	8.16	33.53	0.29	0.13	1.32	0.13	0.66	0.95	0.26	0.13	0.00921	0.00458	0.00229	0.00326	0.00326	0.04578	0.00458
EBKR-6	1.76	335.52	58.83	13.15	45.72	0.44	0.18	1.82	0.18	0.91	1.35	0.36	0.18	0.01712	0.00855	0.00427	0.00673	0.00673	0.08548	0.00855
EBKR-7	0.01	755.63	78.24	9.34	35.91	0.33	0.14	1.43	0.14	0.72	1.05	0.29	0.14	0.01095	0.00547	0.00274	0.00404	0.00404	0.05477	0.00548
EBKR-8	2.22	433.26	60.53	12.72	45.03	0.43	0.18	1.77	0.18	0.89	1.32	0.35	0.18	0.01653	0.00823	0.00412	0.00646	0.00646	0.08233	0.00823
EBKR-9	2.27	450.34	62.31	12.42	44.04	0.42	0.17	1.74	0.17	0.87	1.29	0.35	0.17	0.01599	0.00798	0.00399	0.00623	0.00623	0.07978	0.00798
EBKR-10	4.46	927.50	85.84	7.81	32.11	0.28	0.13	1.28	0.13	0.64	0.93	0.26	0.13	0.00852	0.00426	0.00213	0.00298	0.00298	0.04257	0.00426
EBKR-11	2.95	537.48	66.76	11.55	41.79	0.40	0.17	1.65	0.17	0.83	1.22	0.33	0.17	0.01457	0.00727	0.00364	0.00562	0.00562	0.07269	0.00727
EBKR-12	2.86	899.85	84.28	8.08	32.96	0.29	0.13	1.31	0.13	0.65	0.95	0.26	0.13	0.00899	0.00449	0.00224	0.00318	0.00318	0.04488	0.00449
EBKR-13	4.30	321.59	57.60	13.48	46.20	0.45	0.18	1.85	0.18	0.92	1.38	0.37	0.18	0.01757	0.00878	0.00439	0.00694	0.00694	0.08783	0.00878
EBKR-14	2.31	857.06	82.98	8.40	33.51	0.30	0.13	1.34	0.13	0.67	0.97	0.27	0.13	0.00945	0.00472	0.00236	0.00338	0.00338	0.04724	0.00472
Union Ditch Subwatershed																				
UD-1	0.04	635.67	72.70	10.46	38.65	0.36	0.15	1.55	0.15	0.77	1.14	0.31	0.15	0.01274	0.00637	0.00318	0.00482	0.00482	0.06352	0.00635
UD-2	3.36	551.11	67.88	11.42	41.06	0.39	0.16	1.64	0.16	0.82	1.21	0.33	0.16	0.01428	0.00714	0.00357	0.00550	0.00550	0.07140	0.00714
UD-3	1.57	692.52	75.38	9.92	37.31	0.35	0.15	1.49	0.15	0.75	1.09	0.30	0.15	0.01188	0.00594	0.00297	0.00445	0.00445	0.05935	0.00593
UD-4	4.41	852.28	82.58	8.45	33.77	0.30	0.13	1.35	0.13	0.67	0.98	0.27	0.13	0.00955	0.00477	0.00239	0.00343	0.00343	0.04772	0.00477
UD-5	2.82	791.39	79.69	9.04	35.19	0.32	0.14	1.40	0.14	0.70	1.02	0.28	0.14	0.01049	0.00524	0.00262	0.00384	0.00384	0.05240	0.00524
UD-6	3.17	491.76	65.30	11.93	42.37	0.41	0.17	1.69	0.17	0.85	1.25	0.34	0.17	0.01510	0.00755	0.00377	0.00585	0.00585	0.07546	0.00755
UD-7	0.42	885.98	83.40	8.13	33.61	0.29	0.13	1.31	0.13	0.66	0.95	0.26	0.13	0.00920	0.00457	0.00228	0.00326	0.00326	0.04569	0.00457
UD-8	4.98	1000.86	89.09	7.08	30.62	0.26	0.12	1.21	0.12	0.60	0.87	0.24	0.12	0.00743	0.00370	0.00185	0.00249	0.00249	0.03699	0.00370
UD-9	0.42	1107.27	93.26	6.10	28.79	0.23	0.11	1.11	0.11	0.56	0.79	0.22	0.11	0.00601	0.00296	0.00148	0.00185	0.00185	0.02962	0.00296
UD-10	0.93	956.59	86.88	7.48	31.80	0.27	0.12	1.25	0.12	0.62	0.90	0.25	0.12	0.00811	0.00403	0.00202	0.00278	0.00278	0.04032	0.00403
UD-11	4.84	801.65	80.09	8.93	35.04	0.32	0.14	1.39	0.14	0.70	1.01	0.28	0.14	0.01034	0.00516	0.00258	0.00377	0.00377	0.05161	0.00516
UD-12	4.61	903.39	84.72	7.98	32.76	0.29	0.13	1.30	0.13	0.65	0.94	0.26	0.13	0.00884	0.00441	0.00221	0.00311	0.00311	0.04407	0.00441
UD-13	5.11	876.24	83.31	8.28	33.44	0.30	0.13	1.33	0.13	0.66	0.96	0.27	0.13	0.00930	0.00464	0.00232	0.00331	0.00331	0.04644	0.00464
UD-14	5.12	854.91	82.33	8.49	33.90	0.30	0.13	1.35	0.13	0.67	0.98	0.27	0.13	0.00963	0.00481	0.00240	0.00346	0.00346	0.04810	0.00481
UD-15	6.39	761.32	76.83	9.46	36.87	0.33	0.14	1.45	0.14	0.72	1.06	0.29	0.14	0.01131	0.00563	0.00281	0.00418	0.00418	0.05625	0.00562
UD-16	3.36	413.27	62.49	12.50	43.76	0.42	0.17	1.75	0.17	0.87	1.30	0.35	0.17	0.01600	0.00800	0.00400	0.00625	0.00625	0.07998	0.00800
UD-17	2.55	773.80	79.11	9.18	35.45	0.33	0.14	1.42	0.14	0.71	1.03	0.28	0.14	0.01069	0.00534	0.00267	0.00392	0.00392	0.05343	0.00534
UD-18	4.04	803.30	80.02	8.88	35.18	0.32	0.14	1.39	0.14	0.69	1.01	0.28	0.14	0.01033	0.00514	0.00257	0.00376	0.00376	0.05144	0.00514
Virgil Ditch Subwatershed																				
VD-1	2.08	885.56	83.27	8.15	33.69	0.29	0.13	1.31	0.13	0.66	0.95	0.26	0.13	0.00923	0.00458	0.00229	0.00327	0.00327	0.04583	0.00458
VD-2	2.40	912.43	85.10	7.91	32.57	0.29	0.13	1.29	0.13	0.65	0.93	0.26	0.13	0.00872	0.00435	0.00218	0.00306	0.00306	0.04349	0.00435
VD-3	0.26	825.27	81.50	8.70	34.25	0.31	0.14	1.37	0.14	0.68	1.00	0.27	0.14	0.00992	0.00496	0.00248	0.00359	0.00359	0.04960	0.00496
VD-4	2.86	940.38	84.94	7.66	33.12	0.28	0.13	1.27	0.13	0.63	0.91	0.25	0.13	0.00861	0.00424	0.00212	0.00298	0.00298	0.04244	0.00424
VD-5	3.84	638.76	71.96	10.51	39.18	0.37	0.16	1.55	0.16	0.78	1.14	0.31	0.16	0.01291	0.00644	0.00322	0.00489	0.00489	0.06440	0.00644
VD-6	1.74	745.61	77.66	9.40	36.28	0.33	0.14	1.44	0.14	0.72	1.05	0.29	0.14	0.01111	0.00554	0.00277	0.00410	0.00410	0.05544	0.00554
VD-7	2.06	843.22	81.87	8.55	34.19	0.31	0.14	1.35	0.14	0.68	0.98	0.27	0.14	0.00976	0.00487	0.00243	0.00351	0.00351	0.04868	0.00487
VD-8	2.41	935.52	86.35	7.68	31.91	0.28	0.13	1.27	0.13	0.63	0.91	0.25	0.13	0.00834	0.00416	0.00208	0.00289	0.00289	0.04162	0.00416
VD-9	2.17	1017.47	89.50	6.93	30.54	0.26	0.12	1.19	0.12	0.60	0.85	0.24	0.12	0.00726	0.00360	0.00180	0.00241	0.00241	0.03599	0.00360
VD-10	3.79	948.29	86.44	7.57	32.02	0.28	0.13	1.26	0.13	0.63	0.91	0.25	0.13	0.00825	0.00410	0.00205	0.00285	0.00285	0.04101	0.00410
VD-11	3.53	1009.24	89.45	7.03	30.40	0.26	0.12	1.20	0.12	0.60	0.86	0.24	0.12	0.00733	0.00365	0.00183	0.00245	0.00245	0.03652	0.00365

Table 3-51 Estimated Pollutant Loading by Subwatershed in the East Branch of the South Branch Kishwaukee River watershed (mg/L)

SMU	Area (square mile)	TSS	TDS	BOD	COD	TP	PO_4	TN	NO_3	NO_2/NO_3	TKN	ORGN	NH_4	Pb	Cu	Cd	Cr	Ni	Zinc	Hg
East Branch of the South Branch Kishwaukee River Subwatershed																				
EBKR-1	0.02	437.9	384.13	22.73	172.43	0.91	0.45	4.55	0.45	2.27	3.18	0.91	0.45	0.03	0.01	0.01	0.01	0.01	0.14	0.01
EBKR-2	3.73	527.48	298483.94	79635.31	269567.23	2668.07	1075.37	10753.66	1075.37	5376.83	8044.90	2150.73	1075.37	105.27	52.61	26.30	41.85	41.85	526.06	52.61
EBKR-3	1.58	512.01	110530.38	28905.85	98607.66	969.56	391.44	3914.41	391.44	1957.21	2926.76	782.88	391.44	38.24	19.09	9.54	15.17	15.17	190.89	19.09
EBKR-4	3.62	501.06	226537.45	55843.63	190472.29	1877.73	760.86	7608.62	760.86	3804.31	5682.04	1521.72	760.86	73.22	36.60	18.30	28.99	28.99	365.98	36.60
EBKR-5	5.75	448.61	160952.59	15741.65	64685.16	568.70	253.87	2538.66	253.87	1269.33	1838.03	507.73	253.87	17.76	8.83	4.42	6.29	6.29	88.33	8.83
EBKR-6	1.76	492.61	100554.86	22476.30	78152.35	759.75	310.22	3102.24	310.22	1551.12	2310.87	620.45	310.22	29.27	14.61	7.31	11.51	11.51	146.10	14.61
EBKR-7	0.01	453.31	265.06	31.63	121.65	1.12	0.49	4.86	0.49	2.43	3.55	0.97	0.49	0.04	0.02	0.01	0.01	0.01	0.19	0.02
EBKR-8	2.22	472.32	96603.12	20298.35	71876.13	688.75	282.79	2827.88	282.79	1413.94	2102.69	565.58	282.79	26.38	13.14	6.57	10.31	10.31	131.41	13.14
EBKR-9	2.27	471.46	97561.12	19452.77	68949.21	661.87	272.82	2728.15	272.82	1364.08	2025.95	545.63	272.82	25.04	12.49	6.25	9.76	9.76	124.90	12.49
EBKR-10	4.46	447.68	122062.48	11112.29	45658.38	404.47	182.22	1822.22	182.22	911.11	1315.58	364.44	182.22	12.12	6.05	3.03	4.23	4.23	60.54	6.05
EBKR-11	2.95	463.91	112387.66	19435.74	70340.85	667.24	278.52	2785.25	278.52	1392.62	2059.86	557.05	278.52	24.53	12.24	6.12	9.45	9.45	122.39	12.24
EBKR-12	2.86	448.21	79074.80	7582.13	30922.24	274.37	122.73	1227.31	122.73	613.65	888.03	245.46	122.73	8.44	4.21	2.10	2.98	2.98	42.09	4.21
EBKR-13	4.30	494.93	251532.10	58856.58	201753.24	1984.04	806.90	8069.05	806.90	4034.52	6018.56	1613.81	806.90	76.71	38.35	19.18	30.28	30.28	383.54	38.35
EBKR-14	2.31	449.78	66267.11	6711.90	26762.42	241.29	107.05	1070.50	107.05	535.25	776.54	214.10	107.05	7.54	3.77	1.89	2.70	2.70	37.72	3.77
Union Ditch Subwatershed																				
UD-1	0.04	458.78	1561.75	224.71	830.31	7.82	3.32	33.21	3.32	16.61	24.42	6.64	3.32	0.27	0.14	0.07	0.10	0.10	1.37	0.14
UD-2	3.36	463.30	126352.34	21266.83	76440.22	731.08	305.74	3057.45	305.74	1528.72	2259.81	611.49	305.74	26.58	13.29	6.65	10.23	10.23	132.91	13.29
UD-3	1.57	455.96	51541.02	6784.77	25508.41	237.73	102.03	1020.34	102.03	510.17	747.90	204.07	102.03	8.12	4.06	2.03	3.04	3.04	40.60	4.06
UD-4	4.41	449.89	126866.07	12982.77	51878.40	466.30	206.64	2066.44	206.64	1033.22	1499.52	413.29	206.64	14.68	7.33	3.67	5.26	5.26	73.31	7.33
UD-5	2.82	451.72	84748.18	9613.68	37421.03	341.58	149.31	1493.09	149.31	746.54	1088.13	298.62	149.31	11.15	5.57	2.79	4.08	4.08	55.72	5.57
UD-6	3.17	468.45	130067.34	23760.39	84388.83	812.40	337.19	3371.95	337.19	1685.97	2498.38	674.39	337.19	30.07	15.03	7.52	11.66	11.66	150.32	15.03
UD-7	0.42	448.45	11576.06	1128.88	4665.05	40.81	18.23	182.29	18.23	91.14	131.95	36.46	18.23	1.28	0.63	0.32	0.45	0.45	6.34	0.63
UD-8	4.98	445.93	130421.25	10367.81	44819.68	384.23	176.87	1768.71	176.87	884.36	1268.58	353.74	176.87	10.88	5.41	2.71	3.65	3.65	54.15	5.41
UD-9	0.42	443.60	10259.04	671.08	3166.80	25.63	12.21	122.11	12.21	61.06	86.69	24.42	12.21	0.66	0.33	0.16	0.20	0.20	3.26	0.33
UD-10	0.93	446.81	24843.39	2138.91	9092.66	78.46	35.69	356.86	35.69	178.43	256.90	71.37	35.69	2.32	1.15	0.58	0.80	0.80	11.53	1.15
UD-11	4.84	451.33	143940.24	16051.56	62964.17	571.40	250.37	2503.73	250.37	1251.86	1823.27	500.75	250.37	18.58	9.28	4.64	6.77	6.77	92.77	9.28
UD-12	4.61	448.29	128008.06	12060.05	49500.82	437.35	196.15	1961.47	196.15	980.73	1418.08	392.29	196.15	13.36	6.66	3.33	4.70	4.70	66.63	6.66
UD-13	5.11	448.93	143871.29	14295.52	57753.87	515.21	229.30	2293.01	229.30	1146.50	1661.71	458.60	229.30	16.07	8.02	4.01	5.72	5.72	80.17	8.02
UD-14	5.12	449.52	146191.10	15084.68	60204.09	541.33	239.63	2396.34	239.63	1198.17	1739.50	479.27	239.63	17.10	8.54	4.27	6.14	6.14	85.40	8.54
UD-15	6.39	451.84	192081.42	23645.80	92184.46	834.37	361.46	3614.56	361.46	1807.28	2641.65	722.91	361.46	28.27	14.06	7.03	10.45	10.45	140.62	14.06
UD-16	3.36	478.71	160611.46	32112.61	112468.37	1091.88	449.63	4496.26	449.63	2248.13	3340.01	899.25	449.63	41.12	20.56	10.28	16.06	16.06	205.55	20.56
UD-17	2.55	452.55	77822.41	9029.35	34870.29	320.07	139.48	1394.81	139.48	697.41	1017.47	278.96	139.48	10.51	5.26	2.63	3.86	3.86	52.56	5.26
UD-18	4.04	451.17	119857.40	13304.58	52696.34	474.03	207.94	2079.39	207.94	1039.70	1513.73	415.88	207.94	15.47	7.70	3.85	5.63	5.63	77.05	7.70
Virgil Ditch Subwatershed																				
VD-1	2.08	448.40	57774.90	5651.84	23376.44	204.24	91.21	912.08	91.21	456.04	660.28	182.42	91.21	6.41	3.18	1.59	2.27	2.27	31.80	3.18
VD-2	2.40	448.02	66082.39	6140.23	25293.82	223.03	100.23	1002.29	100.23	501.15	724.18	200.46	100.23	6.77	3.38	1.69	2.38	2.38	33.78	3.38
VD-3	0.26	450.75	7519.19	802.51	3160.06	28.69	12.64	126.38	12.64	63.19	91.88	25.28	12.64	0.92	0.46	0.23	0.33	0.33	4.58	0.46
VD-4	2.86	446.61	76148.90	6864.97	29693.32	250.77	113.48	1134.75	113.48	567.38	818.15	226.95	113.48	7.72	3.80	1.90	2.67	2.67	38.05	3.80
VD-5	3.84	457.81	130491.07	19056.81	71055.12	662.37	281.24	2812.36	281.24	1406.18	2068.55	562.47	281.24	23.42	11.68	5.84	8.87	8.87	116.78	11.68
VD-6	1.74	453.46	54141.18	6554.57	25297.23	231.50	100.41	1004.05	100.41	502.03	733.52	200.81	100.41	7.75	3.86	1.93	2.86	2.86	38.65	3.86
VD-7	2.06	449.90	59379.06	6200.77	24799.61	222.29	98.27	982.72	98.27	491.36	713.65	196.54	98.27	7.08	3.53	1.76	2.55	2.55	35.29	3.53
VD-8	2.41	447.54	65652.97	5840.91	24260.85	213.24	96.43	964.26	96.43	482.13	695.38	192.85	96.43	6.34	3.16	1.58	2.20	2.20	31.64	3.16
VD-9	2.17	445.41	97836.14	7571.93	33379.76	281.81	130.37	1303.75	130.37	651.87	933.69	260.75	130.37	7.93	3.93	1.97	2.63	2.63	39.34	3.93
VD-10	3.79	447.03	94908.99	8307.79	35160.72	304.13	137.98	1379.77	137.98	689.89	994.02	275.95	137.98	9.06	4.50	2.25	3.12	3.12	45.04	4.50
VD-11	3.53	445.78	56504.14	4443.30	19205.80	164.88	76.02	760.18	76.02	380.09	544.97	152.04	76.02	4.63	2.31	1.15	1.55	1.55	23.07	2.31

Table 3-52 Estimated Annual Pollutant Load by Land Use in the East Branch of the South Branch Kishwaukee River watershed (lbs/year)

Source	TDS	BOD	COD	TP	PO4	TN	NO3	NO2/NO3	TKN	Pb	Cu	Cd	Cr	Ni	Zn	Hg
Agricultural	3169664	400988	50148	15478	7697	62584	3969	31426	45031	407	214	114	132	132	1972	197
Forest and Grassland	62174	11237	141914	434	216	1754	11	881	1262	28	214	114	132	132	111	11
Government, Civic and Institutional	11944	9066	10471	292	116	943	299	474	727	15	214	114	132	132	74	7
Industrial	16901	12829	63735	413	164	1335	423	670	1029	22	214	114	132	132	105	11
Mixed Use	1247	947	16665	30	12	98	31	49	76	2	214	114	132	132	8	1
Multifamily Residential	7590	5761	308862	185	74	599	190	301	462	10	214	114	132	132	47	5
Office Space	1985	1506	37440	48	19	157	50	79	121	3	214	114	132	132	12	1
Open Space/Conservation/Parks	51496	9307	600960	359	179	1453	9	729	1045	24	214	114	132	132	92	9
Retail/Commercial	4459	3384	810339	109	43	352	112	177	271	6	214	114	132	132	28	3
Single-family Residential	71570	54325	7083	1747	695	5652	1792	2838	4358	92	214	114	132	132	445	45
Transportation	96505	73252	0.00	2356	937	7622	2417	3827	5876	124	214	114	132	132	600	60
Utility/Waste Facility	844	640	0.00	21	8	67	21	33	51	1	214	114	132	132	5	1

Table 3-53 Levels of pollutant compared to Illinois EPA standards in the East Branch South Branch Kishwaukee River watershed

Pollutant	**Illinois EPA Standard (mg/L)**	**High**	**Medium**	**Low**
TSS	750ppm	**EBKR – 1, 5, 7, 10, 12 & 14** **UD – 4, 5, 7, 8. 9, 10, 11, 12, 13, 14, 15, 17 & 18** **VD – 1, 2, 3, 4, 7, 8, 9, 10 & 11**	EBKR – 8, 9 & 11 UD – 1, 2, 3 & 16 VD – 5 & 6	EBKR – 2, 3, 4, 6 & 13 UD – None VD – None
TDS	1,500 mg/L	None	None	All
BOD	5.0 mg/L	**All**	None	None
COD	30 mg/L	**All but UD-9**	UD-9	
Total Phosphorus	0.05 mg/L	**All**	None	None
Total Nitrogen (TN)	15 mg/L	None	None	All
Total Kjeldahl Nitrogen (TKN)	10 mg/L	None	None	All
Lead (Pb)	0.1 mg/L	None	None	All
Copper (Cu)	1.0 mg/L	None	None	All
Cadmium (Cd)	0.15 mg/L	None	None	All
Chromium (Cr)	0.3 mg/L	None	None	All
Nickel (Ni)	1.0 mg/L	None	None	All
Zinc (Zn)	1.0 mg/L	None	None	All

3.14.5 Summary of Water Quality Assessment

The conclusions drawn and management strategies recommended in this report are the best possible, given the extremely limited water quality data in this watershed. The primary issues with respect to water quality, including those that relate to instream and riparian habitat, are discussed below.

Total Suspended Solids

Nutrient modeling identified Total Suspended Solids (TSS) as a major source of impairment in the Watershed. Additionally, the habitat assessment and stakeholder input has also identified TSS as a major issue in the watershed. The primary impact of high suspended solids concentrations in streams occurs when these solids settle in depositional areas of the stream system and cover the more desirable gravel substrates. Excessive levels of particulate material also create difficult conditions for gill breathing fish and some of their food sources, including macroinvertebrate organisms.

The sources of TSS appear to be streambank and riparian erosion (due to hydrologic instability) with contributions from agricultural and urban runoff. Suspended solids can be transported to the streams and lakes, even from remote areas of the watershed, via storm sewers and roadside ditches.

Increases in impervious cover combined with introduction of stormwater drainage systems in the urban areas and the channelization of streams and the loss of wetlands in the rural areas have led to significant changes in watershed hydrology (flow alterations and hydromodification). This has in turn led to increased streambank and streambed erosion and degradation of instream habitat in many reaches.

As the remaining undeveloped land of the watershed develops, as projected, construction site runoff will be a potential growing source of sediment if soil erosion and sediment control practices are not properly designed, installed, and maintained.

Habitat

There are very limited high quality habitat features such as instream habitat and relatively natural floodplains in the East Branch of the South Branch Kishwaukee River Watershed. As such, biological communities are of poor quality with limited diversity. The lack of instream features, the flashy hydrology of the streams due to urban development and instream alterations within the watershed, periods of very low flow, and low dissolved oxygen conditions in the summer months all contribute to the impacts to the biological community of the creek. Additional biological sampling should be conducted in a variety of locations to establish a baseline from which improvement or degradation can be assessed.

Additionally, there has been significant encroachment by urban uses into the stream corridor and loss of riparian habitat. These encroachments can be locations of yard waste dumping as well as sheet drainage of fertilizers and pesticides into the stream. These encroachments can also disrupt wildlife corridors.

Nutrients

Stormwater runoff is the likely contributor of high nutrient loads, particularly phosphorous, to the stream systems. Stream or streambank dumping of yard waste, grass clippings, and leaves collected in the fall can also contribute significant nutrient loading to the stream. Pet wastes may also contribute to the nutrient loading to the stream.

3.15 Floodplain and Flood Hazard Areas

This section of the plan includes information on the FEMA floodplain as well as areas of known flooding within the East Branch South Branch Kishwaukee River watershed.

3.15.1 Floodplain

Floodplains along stream and river corridors provide a variety of benefits including aesthetic value, flood storage, water quality, and plant and wildlife habitat. However, the most important function is the capacity of the floodplain to hold water during significant rainfall events to minimize flooding. Flood hazard areas are identified on the Flood Insurance Rate Map (FIRMs) and are categorized as a Special Flood Hazard Areas (SFHA). SFHAs are defined as the area that will be inundated by a flood event having a 1-percent chance of being equaled or exceeded in any given year. This 1-percent annual chance flood is commonly referred to as the base flood or 100-year flood. It should be noted that the 100-year flood can and do occur more frequently than every 100 years. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30.

There are approximately 10,580.60 acres of 100-year floodplain with in East Branch South Branch Kishwaukee River watershed (Table 3-54 and Figure 3-31). The East Branch South Branch Kishwaukee watershed 100-year floodplain is classified as Zone A and Zone AE. Zone AE areas are subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply. Mandatory flood insurance purchase requirements and floodplain management standards apply for all structures located in Zone AE.

Zone A Areas are subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown for Zone A areas. Mandatory flood insurance purchase requirements and floodplain management standards apply for all structures located in Zone A.

Table 3-54 Floodplain in the East Branch South Branch Kishwaukee watershed

SFHA	Acres in E Branch S Branch Kishwaukee River subwatershed	Acres in Union Ditch subwatershed	Acres in Virgil Ditch Subwatershed	Total Square Miles in Watershed	Percent of Watershed
AE	2753.56	5410.79	0.0	2062.69	2.61%
A	694.83	5406.84	2416.24	8517.91	10.81%

In addition to the 100-year floodplain, there are 8659.76 acres of Zone X (shaded) floodplain in the East Branch South Branch Kishwaukee River watershed (Table 3-52 and Figure 3-31. Zone X (shaded) is described by FEMA as areas of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. Zone X (shaded) is also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.

3.15.2 Flooding and Drainage Problems

Over the past years the East Branch South Branch Kishwaukee River watershed has recorded some of its worst flooding to date. Five inches of rain fell on September 4, 2006 leading to damage to hundreds of homes (including the Evergreen Mobile Home Park). Less than a year later on August 7, 2007, the watershed was again hit by rain when 5 to 7-inches of rain fell. Many streets, including major thoroughfares were flooded. Following the 2007 storm, the Governor of Illinois declared Rockford and Winnebago County a state disaster area. Debris removal, law enforcement, damage assessment, and other duties were offered by the governor.

In addition to these flooding events caused by significant rainfalls, the East Branch South Branch Kishwaukee River watershed experiences flood and drainage problems following much smaller rainfall events. Several different types of flooding that occurs in the watershed include:

- Overbank flooding from a waterway
- Local drainage problems (shallow flooding on roads, yards and sometimes buildings) often due to development in a drainage way, inadequately maintained drainage ditches, undersized storm sewers, and storm sewers.
- Depressional flooding in areas where water ponds in a natural depression in the landscape and there is no natural outlet for runoff. May be caused by failed sewer or adjacent or surrounding development causing increased runoff into the depressional area.
- Sanitary sewer backups may occur, flooding basements, when stormwater infiltrates into the sanitary sewer pipes, leaky manholes, or inappropriate connections to the sanitary lines.

3.15.3 Constructed Drainage System

The natural drainage system began to experience changes when vacant lands were converted to agricultural uses. During the conversion of land to agricultural uses, hydromodification and channelization began to occur (See Section 3.13.4 for more information on hydromodification and channelization). Now more changes occur as the land transitions from agricultural uses to residential, industrial, commercial, and transportation land uses. Early development was constructed without detention basins with stormwater directed into streams via ditches and storm sewer systems with the goal of removing runoff from the developed areas as quickly as possible. Without detaining stormwater from developed areas, flashy hydrology can become prevalent in the streams. Flashy hydrology results when the water level in streams rises quickly during storm events and then falls quickly once the storm passes. Flashy hydrology can lead to stream channel degradation such as downcutting and channel widening as well as flooding. More recently city planners and engineers have realized the benefit of storing stormwater runoff in detention basins that are designed to capture the runoff from a developed area and release the water slowly over a given amount of time.

Detention basins or detention ponds are stormwater management facilities that are constructed on or adjacent to rivers, streams, or lakes that are designed to store rainfall in order to protect against flooding and protect downstream channels from hydromodification. Detention facilities that are constructed on a river or stream are commonly referred to as "on-line" basins. On-line basins are not recommended and are commonly prohibited under a variety of stormwater regulations. Detention basins that are not on-line are typically constructed in low areas relative to development and either discharge directly to a surface water or discharge to surface water through a stormwater sewer network. Detention basins are typically designed to be dry bottom or wet bottom.

Dry bottom basins typically hold water for short periods of time following rain events. They are commonly lined with manicured turf grass. While dry detention basins may slow water from reaching creeks and rivers, their short residence time do not promote groundwater infiltration or provide significant water quality benefits. Structures such as gazebos and storage sheds should not be located in dry bottom basins.

Wet bottom basins are designed to permanently retain some volume of water at all times. The amount of water is determined by the elevation of the outlet pipe of the basin. The sideslopes of wet bottom basins can be planted with both turf grass or native grasses. Often wet bottom basins planted with turf grass will experience bank erosion resulting in the placement of riprap near the toe of slope as a measure to slow the erosion.

Wet detention basins planted with native vegetation are commonly referred to as naturalized detention basins. Naturalized detention basins are designed to be wet bottom with side slopes and an emergent zone that is planted with native plants, flowers, and shrubs. In addition to providing stormwater management, naturalized detention basins promote groundwater infiltration and maximize the water quality benefits and wildlife habitat.

A detailed detention and/or retention basin inventory was not conducted as part of this watershed-based planning process. As both DeKalb and Kane Counties have had stormwater ordinances in place since the mid-1990s, it is assumed that all development constructed since that time has meet the respective stormwater management requirements that include provisions for detention and/or retention. According to information obtained as part of the watershed planning process, there are no paved stormwater storage areas, automobile parking stormwater storage areas, underground stormwater storage areas, and/or regional compensatory storage facilities in the East Branch South Branch Kishwaukee River Watershed.

3.15.4 Problem Areas Identified By Watershed Stakeholders

During the initial phase of the development of the watershed-based plan, the DeKalb County Watershed Steering Committee (DCWSC) held two (2) public workshops to solicit stakeholder input on the East Branch of the South Branch of the Kishwaukee River watershed. During these meetings, stakeholders were asked to denote problem areas within the watershed. Problems were reported using worksheets designed by the DCWSC committee and their locations were denoted on maps. The problem areas identified at the public meeting were refined by the DCSWC and compiled into five (5) main problem types: water quality concern; streambank erosion or channel condition; overbank flooding; storm water management or drainage issues; and restrictive bridge or culvert. The problem areas identified during the development of the watershed-based plan are discussed in Table 3-55 and their locations depicted in Figure 3-32.

Table 3-55 Summary of Problems in the East Branch South Branch Kishwaukee River Watershed Stakeholders

Label	Location	Submitted Concern	Problem Type: Water Quality Concern	Problem Type: Streambank Erosion or Channel Condition	Problem Type: Overbank Flooding	Problem Type: Stormwater Management or Drainage Issues	Problem Type: Restrictive Culvert or Bridge	Suspected Causes of Impairment and Potential Solutions
East Branch South Branch Kishwaukee River Watershed								
EBKR-1	B&O Junkyard. Brickville Rd. at the river.	Tires and other debris noted in creek. Oil residue observed in water.	✓					Specific property issue. Develop recommendations for this site.
EBKR-2	Evergreen Village Mobile Home Park, 955 East State Street, Sycamore.	Household and automotive waste disposed into river. Potential released of nutrients and fecal coliform from the wastewater treatment plant discharges into the river.	✓					Specific property issue. Develop recommendations for this site.
EBKR-3	Peace Road and E Br S Br Kishwaukee River	Increased flooding observed after road construction. Bridge could be undersized. Erosion observed.		✓				Undersized bridge structure. Determine if recent engineering data regarding the bridge is available. Develop estimates of bridge capacity and identify adverse impacts of bridge.
EBKR-4	Martin's Ditch (City of Sycamore)	Significant flooding of basements, streets, and yards observed following storms				✓		Small urban waterway serves older neighborhoods developed without detention. Stormwater management improvements could reduce flooding and improve water quality. Identify potential remedial stormwater management and green infrastructure projects in this subwatershed.

Label	Location	Submitted Concern	Problem Type					Suspected Causes of Impairment and Potential Solutions
			Water Quality Concern	Streambank Erosion or Channel Condition	Overbank Flooding	Stormwater Management or Drainage Issues	Restrictive Culvert or Bridge	
EBKR-5	Route 64 just east of Old State Road and west of the Hardwood Connection	Roadway flooding observed following storm events. Trees and other debris restricting flow in river.				✓		(Location may be just outside watershed.)
EBKR-6	Blue Heron Creek	Trees and other debris restricting flow in creek.		✓				Develop channel maintenance and riparian buffer management recommendations.
EBKR-7	¼ mile south of Peace Road and Route 64	Overland flow has increased and occurs after a ½ inch rain event.				✓		Drainage pathway leads from high school property.
EBKR-8	Motel Road (north of Route 64)	Major flooding observed after 3 inch rain event.			✓		✓	Bridge crossing potentially undersized. Investigate existing information and develop comparison of peak flows to structure capacity.
EBKR-9	Quarry	Water quality impacts from quarry discharge	✓					Specific property issue. Develop recommendations for this site.
EBKR-10	Barber Green and E Branch S Branch Kishwaukee River (north of quarry)	Flow is restricted by bridge.					✓	Bridge crossings potentially undersized. Investigate existing information and develop comparison of peak flows to structure capacity.
EBKR-11	E Branch S Branch Kishwaukee River just north of Bethany Road and Fenstemaker Road	River bends 90-degrees. Trees and other debris restricting flow in creek. Bank erosion observed.	✓	✓				Develop channel maintenance and riparian buffer management recommendations. Consider river restoration to reduce channelization and locations with poor hydraulic performance.

Label	Location	Submitted Concern	Problem Type					Suspected Causes of Impairment and Potential Solutions
			Water Quality Concern	Streambank Erosion or Channel Condition	Overbank Flooding	Stormwater Management or Drainage Issues	Restrictive Culvert or Bridge	
EBKR-12	E Branch S Branch Kishwaukee River along Airport Road just north of Bethany Road	Erosion observed.	✓	✓				Develop channel maintenance and riparian buffer management recommendations including streambank stabilization projects.
EBKR-13	Loves Road/Juniper Street/DeKalb Taylor Municipal Airport area (from Barber Green Road south to the railroad tracks)	Stormwater from west side of Loves Road floods homes on the east side of Loves Road. It appears that the water should flow into the detention pond located within the park but flow is restricted due to grading.				✓		Local drainage concern. Once investigated, could involve the improvement of detention basin operation.
EBKR-14	Near Plank Road	Trees and other debris restricting flow in creek.		✓				Develop channel maintenance and riparian buffer management recommendations.
EBKR-15	12764 William Road	Trees and other debris restricting flow in creek. Restrictive culvert also noted.		✓			✓	Develop channel maintenance and riparian buffer management recommendations.
EBKR-16	12733 William Road	Restrictive culvert noted.					✓	
EBKR-17	0.2 miles north of Pleasant Road along Airport Road	Restrictive culvert noted.					✓	
EBKR-18	0.5 miles north of Pleasant Road along Airport Road	Restrictive culvert noted.					✓	

Label	Location	Submitted Concern	Problem Type					Suspected Causes of Impairment and Potential Solutions
			Water Quality Concern	Streambank Erosion or Channel Condition	Overbank Flooding	Stormwater Management or Drainage Issues	Restrictive Culvert or Bridge	
Union Ditch								
UD-1	Union Ditch #3 and County Line Road	Flow is restricted by bridge. Flooding observed after 4-inch rainfall event.				✓		Bridge crossings potentially undersized. Investigate existing information and develop comparison of peak flows to structure capacity.
UD-2	Union Ditch #3 – Maple Park Branch	Trees and other debris restricting flow in creek. Creek is also silted in.	✓	✓				Develop channel maintenance and riparian buffer management recommendations.
UD-3	Union Ditch south of Sycamore to the Union Drainage District	Trees and other debris restricting flow in creek.	✓	✓				Develop channel maintenance and riparian buffer management recommendations.
UD-4	East of Meredith Road between Welters Road and Beith Road	Significant flooding following rain events. Tile needs to be protected. Bank erosion observed.	✓	✓	✓	✓	✓	Bridge crossings potentially undersized. Investigate existing information and develop comparison of peak flows to structure capacity. Develop channel maintenance and riparian buffer management recommendations.
UD-5	Landfill	Potential for water quality concerns. Trash and debris blows from trucks into watershed.	✓					Specific property issue. Develop recommendations for this site.
UD-6	Corner of Ottawa St. and Chestnut-Cortland Road	Significant flooding following rain events. Water seems to originate at the elevator in Cortland.				✓		Local drainage issue.

Label	**Location**	**Submitted Concern**	**Problem Type**					**Suspected Causes of Impairment and Potential Solutions**
			Water Quality Concern	Streambank Erosion or Channel Condition	Overbank Flooding	Stormwater Management or Drainage Issues	Restrictive Culvert or Bridge	
UD-7	Chase Road and Union Ditch	Trees and other debris restricting flow in creek. Potential for water quality concerns.	✓	✓				Develop channel maintenance and riparian buffer management recommendations.
UD-8	Airport Road and North Street	Continuous no-till (corn and soybean rotation).	✓					Agricultural management recommendations would be needed to address this concern.
UD-9	Maple Park Wastewater Treatment Plan	Significant algae observed on settling ponds.	✓					Review processes employed at the lagoons (aeration, etc.) and water quality records for the facility. Some algae is nearly unavoidable.
UD-10	West limits of Virgil #1 Drainage District (north of Beth Road and Thatcher Road)	Trees and other debris restricting flow in creek. Extensive channelization observed.	✓	✓				Develop channel maintenance and riparian buffer management recommendations.
UD-11	Elburn Village limits to Virgil #1 Drainage District (taxable limits) (northwest of Route 38 and Route 47).	Stormwater discharge from Jewel Shopping Center under Route 38 contributes to the overland and tiled flow into the district waterway.	✓			✓		Local drainage issue. Review existing stormwater management facilities. Look for stormwater management facility retrofits or enhancements.
UD-12	Headwaters of Virgil #1 Drainage District (east and south, property east of Route 47)	Virgil #1 Drainage District receives extensive runoff from adjacent lands.	✓			✓		Adjacent lands appear to all be agricultural. No apparent modifications to tributary areas.
UD-13	Union Ditch #2 at County Line Road and DeKalb Road	Flooding observed.						Local drainage issue.

Label	Location	Submitted Concern	Problem Type					Suspected Causes of Impairment and Potential Solutions
			Water Quality Concern	Streambank Erosion or Channel Condition	Overbank Flooding	Stormwater Management or Drainage Issues	Restrictive Culvert or Bridge	
UD-14	Virgil Ditch #3 at Peplow Road	Erosion observed.		✓				Review upstream flows, develop streambank stabilization recommendations.
UD-15	Village of Lily Lake (headwaters of Virgil Ditch #2.	Water quality concerns (fecal coliform) associated with septic systems.	✓					Develop septic system maintenance recommendations.
UD-16	Burlington Road over Virgil Ditch #2	Restrictive culvert or bridge noted.					✓	Bridge crossings potentially undersized. Investigate existing information and develop comparison of peak flows to structure capacity.
Virgil Ditch								
VD-1	Ramm Road south to Union Ditch	Creek has silted in	✓	✓				Develop channel maintenance recommendations.
VD-2	½ mile East of Peplow Road and Ramm Road	Flooding observed.			✓			Bridge crossings potentially undersized. Investigate existing information and develop comparison of peak flows to structure capacity. Unless pavement floods, no developed property appears at risk here.
VD-3	Virgil Ditch south of Route 64	Significant bank erosion noted in channel.		✓				Review upstream flows, develop streambank stabilization recommendations.
VD-4	Field tiles located north of Route 64	Tiles are functioning but steel end needs to be leveled.		✓				Maintenance issue related to tiles.

Label	Location	Submitted Concern	Problem Type					Suspected Causes of Impairment and Potential Solutions
			Water Quality Concern	Streambank Erosion or Channel Condition	Overbank Flooding	Stormwater Management or Drainage Issues	Restrictive Culvert or Bridge	
VD-5	5N851 McGough Road	Water originating offsite flows onto property through culverts causing water to pond on the property.				✓		Local drainage issue. Property is near a drainage divide.
VD-6	Near Burlington School District Property (west of Peace Road and north of Ellithorpe Road)	Trees and other debris restricting flow in creek.		✓				Develop channel maintenance and riparian buffer management recommendations.

3.16 Critical Areas

The intent of identifying Critical Areas is to focus watershed improvement efforts on areas where impairments are concentrated or relatively worse than in other areas of the watershed. Restoration, prevention, and remediation efforts in these Critical Areas are expected to achieve a greater impact than in less critical parts of the watersheds. These results and recommendations for watershed improvement, have been incorporated into the Watershed Action Plan.

3.16.1 Critical SMUs

Critical SMUs are those that have particularly strong impact on watershed resources and water quality due to the type and extent of current and planned development. These subbasins will require action to reduce the impact of existing impervious surfaces. Critical Subbasins are listed in Table 3-56 and shown on Figure 3-33 and include the following:

Table 3-56 Critical SMUs

SMU	Acres	Rationale
EBKR-2	2389.18	• Future land use changes • Blue Heron Creek headwater area
EBKR-6	1128.93	• Hydromodification • Streambank erosion
UD-9	266.38	• Future land use changes
UD-15	4088.48	• Future land use changes
VD-2	1534.24	• Headwater area • Future land use changes
VD-7	1319.43	• Future land use changes

3.17 Summary and Conclusions

The East Branch of the South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) watershed resource inventory and assessment provides important insight into the issues and problems in the watershed and the opportunities available for preserving and improving watershed resources. The vast majority of the impacts and impairments to watershed resources identified are the direct result of years of modification of the stream and surrounding lands as land use in the watershed changed from undeveloped to agriculture. The impacts of this changing landscape on watershed resources are summarized here and actions for addressing these impacts are included in the Action Plan in Chapter 5.

It is important to identify potential causes and sources of impairment in the watershed so that preventive and restorative measures can be planned and implemented. The issues, causes and sources identified below and in Table 3-57 are based on the best professional judgment based on the watershed inventory assessment and input from the watershed stakeholders. Thus, they should be considered as potential rather than confirmed until additional sampling and surveying can be done. Table 3-57 includes those impairments, causes, and sources that are most relevant to the Watershed-Based Plan nine element requirements of the US EPA. Nonetheless, although the table does not include all of the issues and problems identified below, they all have been addressed within the Action Plan included in Chapter 5.

Water Quality

The most important water quality issues that need to be addressed include the following:

- Elevated levels of total suspended solids generated from streambank and riparian erosion and storm water runoff;
- low dissolved oxygen concentrations due to low flow and the lack of adequate stream habitat features to help oxygenate the water; and
- elevated levels of bacteria and nutrients from failing septic systems and straight pipes.

Watershed Hydrology

The most important issues related to watershed hydrology that need to be addressed include the following.

- flashy hydrology (higher high flows and lower low flows), which impact a number of other watershed resources; and
- unmaintained, undersized and/or damaged culverts and roadside conveyance systems restricting flow in the stream channels; and

Stream Channels

The most important issues related to stream channels that need to be addressed include the following:

- streambank erosion resulting from poor riparian management, flashy hydrology, unstable streambanks, and stormwater discharges; and
- debris buildup and obstruction within the stream channel that is the result of streambank erosion and dislodged trees and vegetation.

Riparian Corridors

The most important riparian corridor issues that need to be addressed include the following:

- lack of riparian vegetation;
- inadequate riparian vegetation management that leads to destabilizes streambanks and provides no water quality or riparian habitat benefits; and
- dumping of yard waste along the stream banks and in stream channels, which smothers ground level vegetation and adds organic matter and nutrients to the water.

Natural Areas and Wetlands

The most important issues related to watershed wetlands include the following:

- lack of management and restoration plans and action to preserve and restore native habitat;
- invasive species infestations that degrade natural habitat;
- lost wetland acreage; and
- impairment of natural hydrologic patterns that support healthy wetlands resulting from stormwater discharge.

Flooding

The most important flooding issues that need to be addressed include the following:

- risk of flood damage to structures located along the waterways;

- hydrologic modification causing high flows; and
- creation of detention and retention areas including wetlands and depressional storage.

Land Use

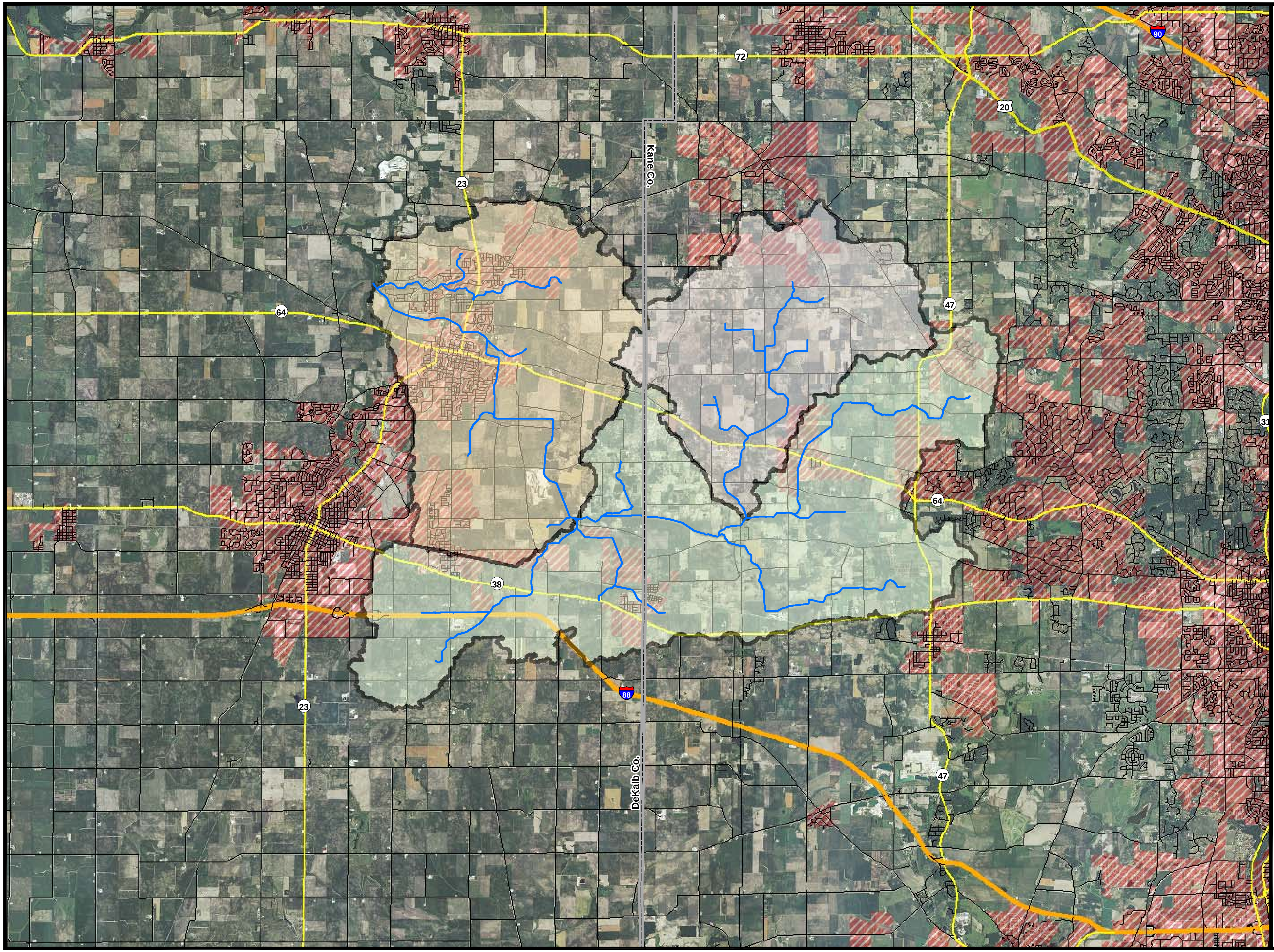
The most important land use issues that need to be addressed include the following:

- conversion of vacant, agricultural, or open land to urban uses, which increases impervious surface area and impacts water quality and runoff volume; and
- redevelopment of existing developed land to other land uses with greater impervious surface area and/or higher pollutant loading rates.

Table 3-57 Watershed Impairments, Causes and Sources

Impairment	**Causes**	**Sources**
Water Quality	Total suspended solids/sedimentation and siltation	In channel erosion caused by streambank modification and destabilization
		Urban runoff/storm sewers
		Agricultural activities
		Construction sites
		Streets, highway and bridge runoff
Water Quality	Nutrients – phosphorus and nitrogen	Urban runoff/storm sewers
		Soil erosion
		Agricultural activities/golf courses
		Improper disposal of wastes (yard waste, pet waste, etc)
		Leaking septic systems and straight pipes
Water Quality	Low dissolved oxygen (elevated biological oxygen demand & chemical oxygen demand)	Flow alteration (low flow)
		Habitat modifications
		Urban runoff/storm sewers
		Improper disposal of wastes (yard waste, pet waste, etc)
Water Quality	Bacteria	Leaking septic systems and straight pipes
Habitat degradation	Hydromodification and flow alterations	Urban runoff/storm sewers
		Loss of riparian buffer
		Loss of floodplain, wetlands, and depressional storage
		Modification to stream flow regime
		Development
		Habitat modifications
Habitat degradation	Lack of instream habitat	Unstable streambanks
		Channelization
		Habitat modifications
Habitat degradation	Loss of riparian buffer	Development
		Inappropriate land management
		Unstable streambanks
		Habitat modifications
Increased stream flows	Increased rate and volume or runoff	Development
		Loss of floodplain, wetlands, and depressional storage
		Poorly functioning/undersized detention
Increased stream flows	Loss of floodplain, wetlands, and depressional storage	Draining of floodplain, wetlands, and depressional storage
		Development

Impairment	Causes	Sources
Flood damage	Past encroachment on floodplain	Past floodplain development
Flood damage	Undersize/improperly maintained infrastructure (storm sewers, culverts, detention, etc)	Development
		Lack of infrastructure maintenance



0 1 2
Miles
1 inch = 11,000 feet

N
W E
S

Legend

- Rivers & Streams
- E.B. Kishwaukee River
- Union Ditch
- Virgil Ditch
- County Boundary
- ▨ Municipalities
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets

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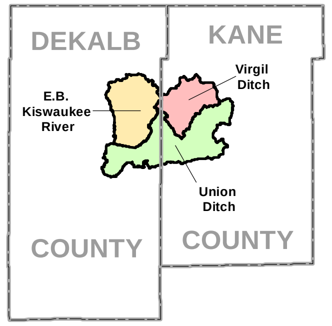
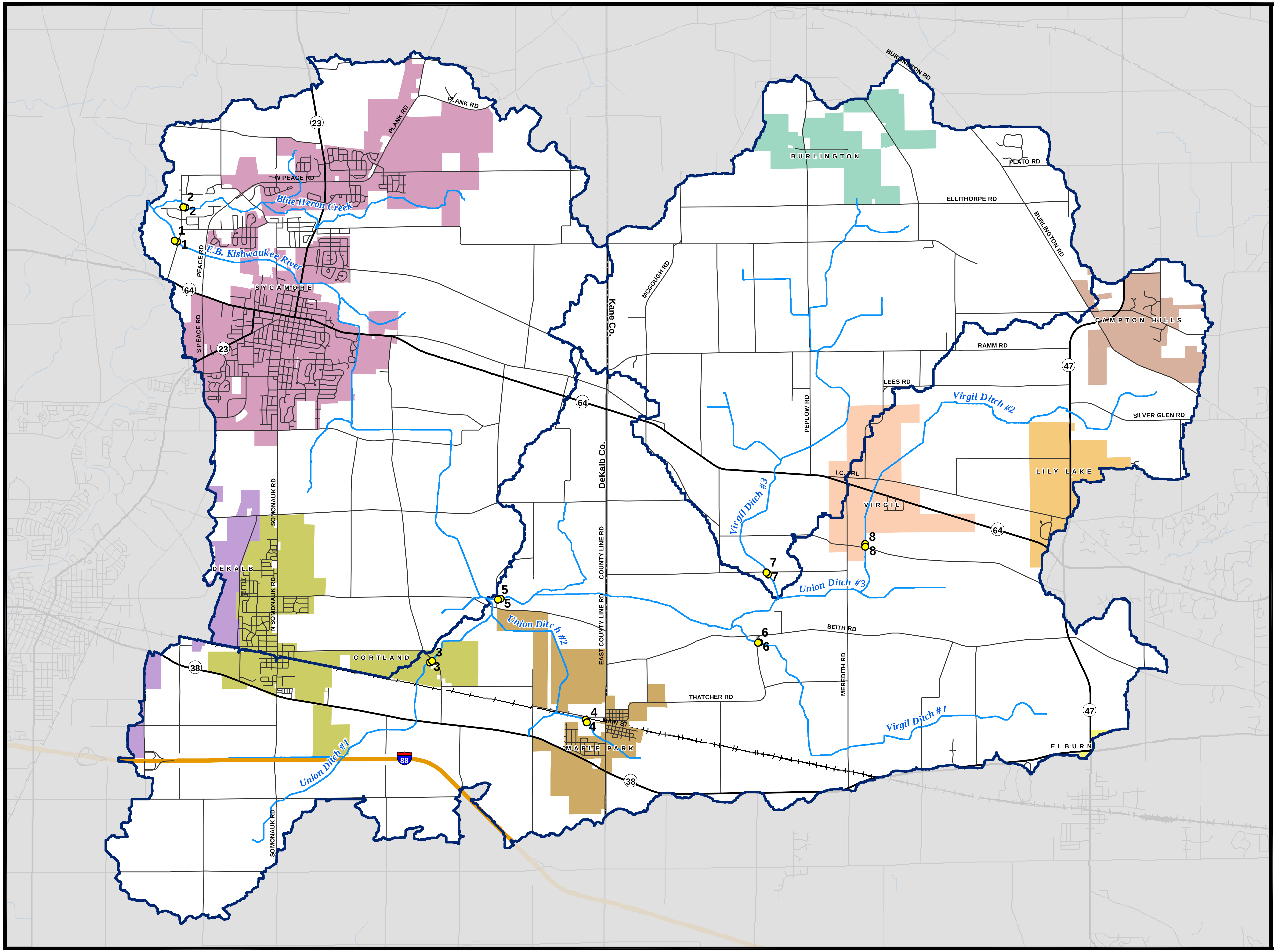


3-1 - General Watershed Location



Legend

- ● Sampling Points
- Rivers & Streams
- Watershed Boundary
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets
- Railroads
- County Boundary

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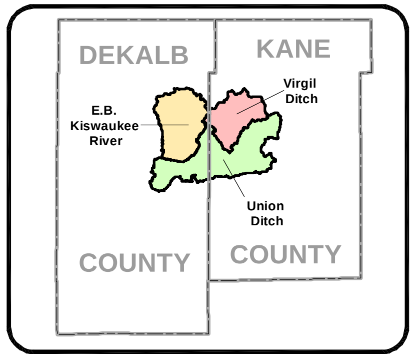
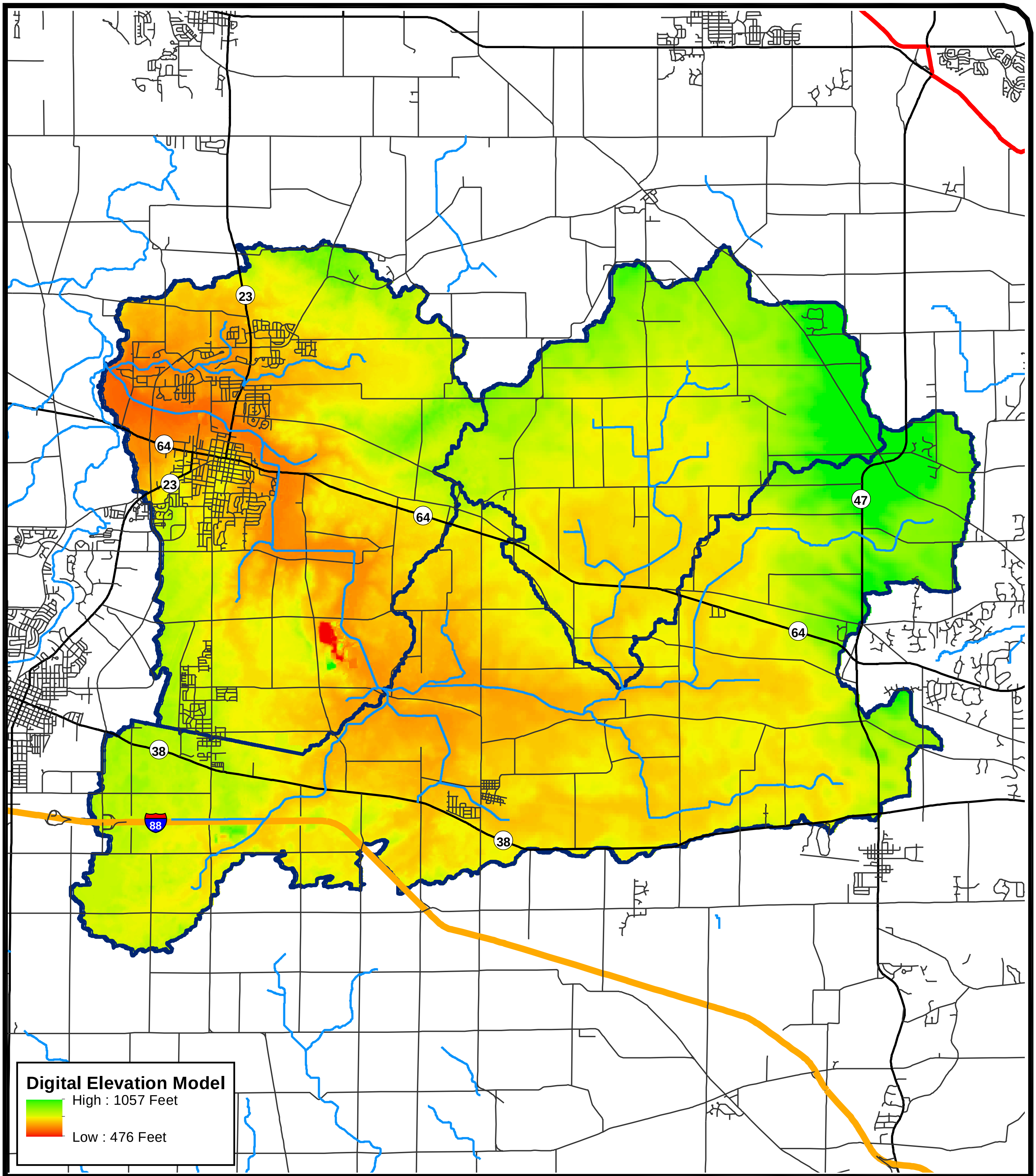
Watershed
Improvement Plan



3-2 - Watershed Map



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Legend

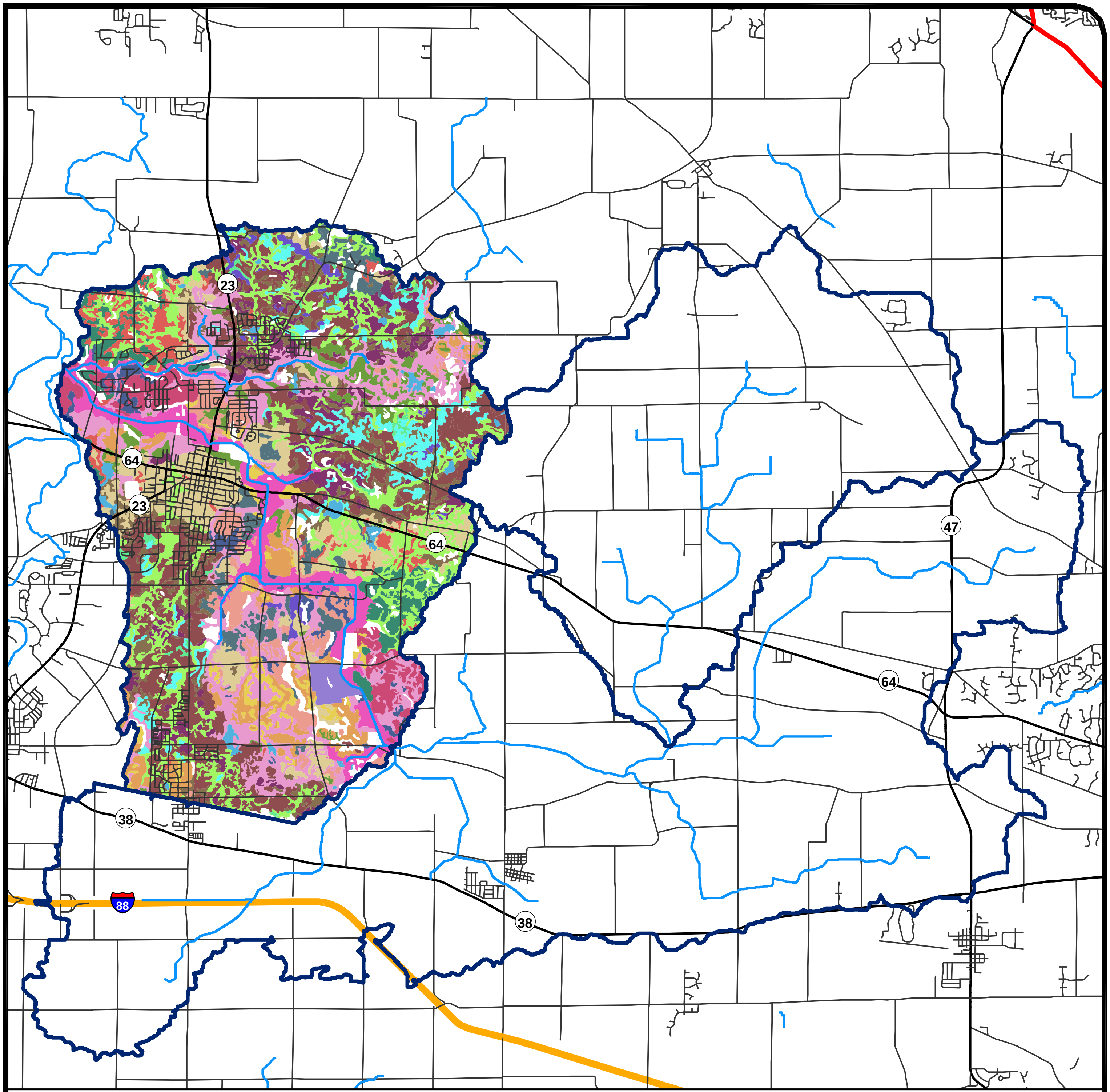
- Rivers & Streams
- Watershed Boundary
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets

0 0.75 1.5
Miles

1 inch = 11,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-3 - Digital Elevation Model



Dominant Soil Units

🟩 59 - Lisbon silt loam
🟪 60 - La Rose silt loam
🟥 62 - Herbert silt loam
🟦 67 - Harpster silty clay loam

🟨 104 - Virgil silt Loam
🟪 152 - Drummer silty clay loam
🟫 154 - Flanagan silt loam
🟪 171 - Catlin silt loam

🟩 193 - Mayville silt loam
🟩 198 - Elburn silt loam
🟦 219 - Millbrook silt loam
🟦 221 - Parr silt loam

🟨 348 - Wingate silt loam
🟩 356 - Elpaso silty clay loam
🟫 512 - Danabrook silt loam
⬛ 656 - Octagon silt loam

🟧 662 - Barony silt loam
🟧 667 - Kaneville silt loa
🟥 668 - Somonauk silt loam
🟪 865 - Pits, gravel
🟪 3076 - Otter silt loam

(non-dominant soil units are white)

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Legend

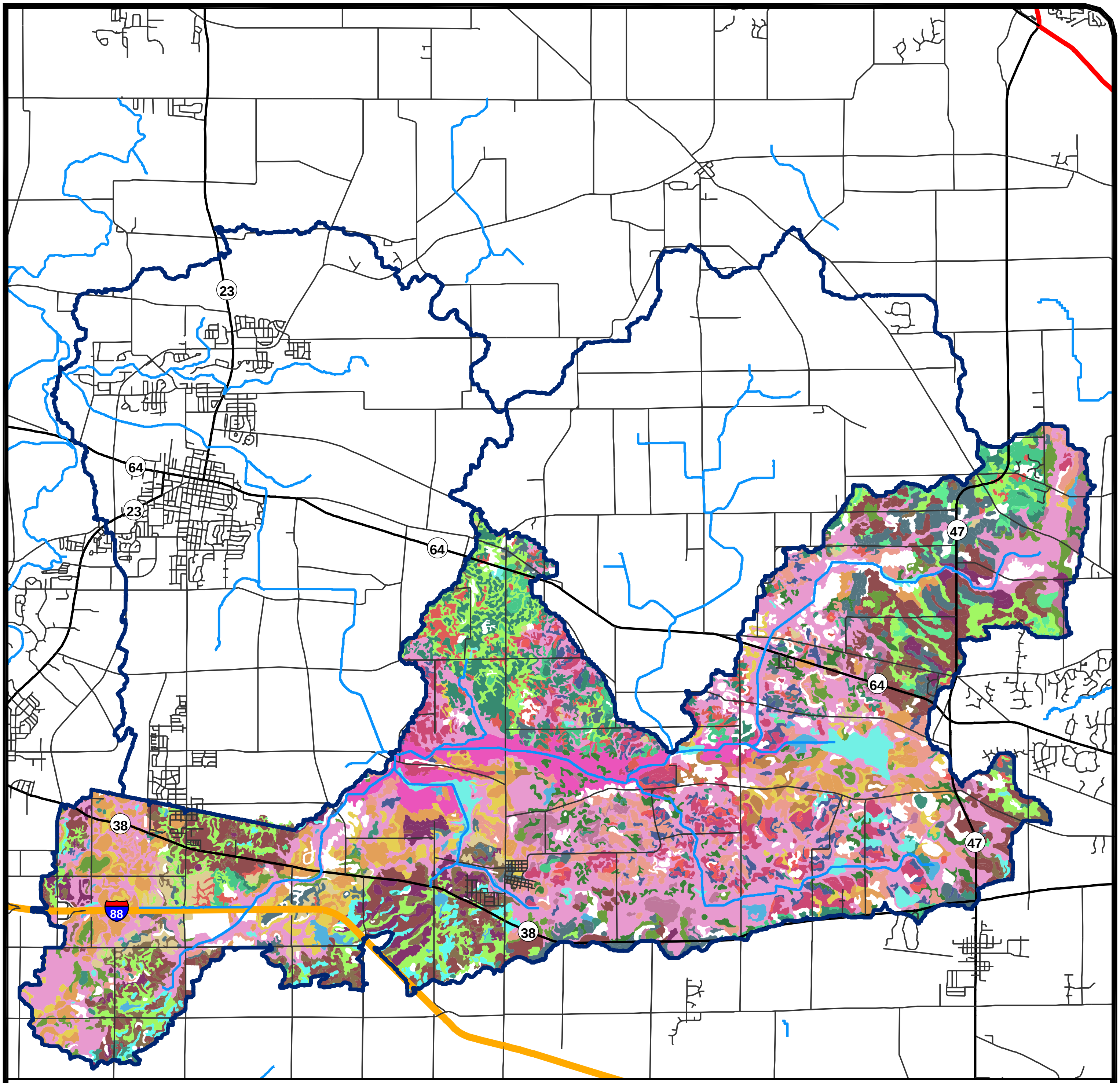
▢ Watershed Boundary
— Rivers & Streams
— Interstate/Tollway
— U.S. Highway
— State Highway
— Streets

0 0.75 1.5
Miles

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-4 - Dominant Soils in the East Branch Kishwaukee River Subwatershed



Dominant Soil Units

- 🟩 59 - Lisbon silt loam
- 🟥 62 - Herbert silt loam
- 🟦 67 - Harpster silty clay loam
- 🟦 103 - Houghton muck
- 🟨 104 - Virgil silt loam
- 🟥 134 - Camden silt loam
- 🟩 149 - Brenton silt loam
- 🟪 152 - Drummer silt loam
- 🟫 154 - Flanagan silt loam
- 🟪 171 - Catlin silt loam
- 🟩 193 - Mayville silt loam
- 🟩 198 - Elburn silt loam
- 🟦 219 - Millbrook silt loam
- 🟦 221 - Parr silt loam
- 🟩 330 - Peotone silty clay loam
- 🟨 348 - Wingate silt loam
- 🟩 356 - Elpaso silty clay loam
- 🟫 512 - Danbrook silt loam
- 🟩 527 - Kidami silt loam
- ⬛ 656 - Octagon silt loam
- 🟧 662 - Barony silt loam
- 🟪 663 - Clare silt loam
- 🟧 667 - Kaneville silt loam
- 🟥 668 - Somonauk silt loam
- 🟫 680 - Campton silt loam
- 🟪 3076 - Otter silt loam

(non-dominant soil units are white)

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Legend

- ▭ Watershed Boundary
- ━ Rivers & Streams
- ━ Interstate/Tollway
- ━ U.S. Highway
- ━ State Highway
- ─ Streets

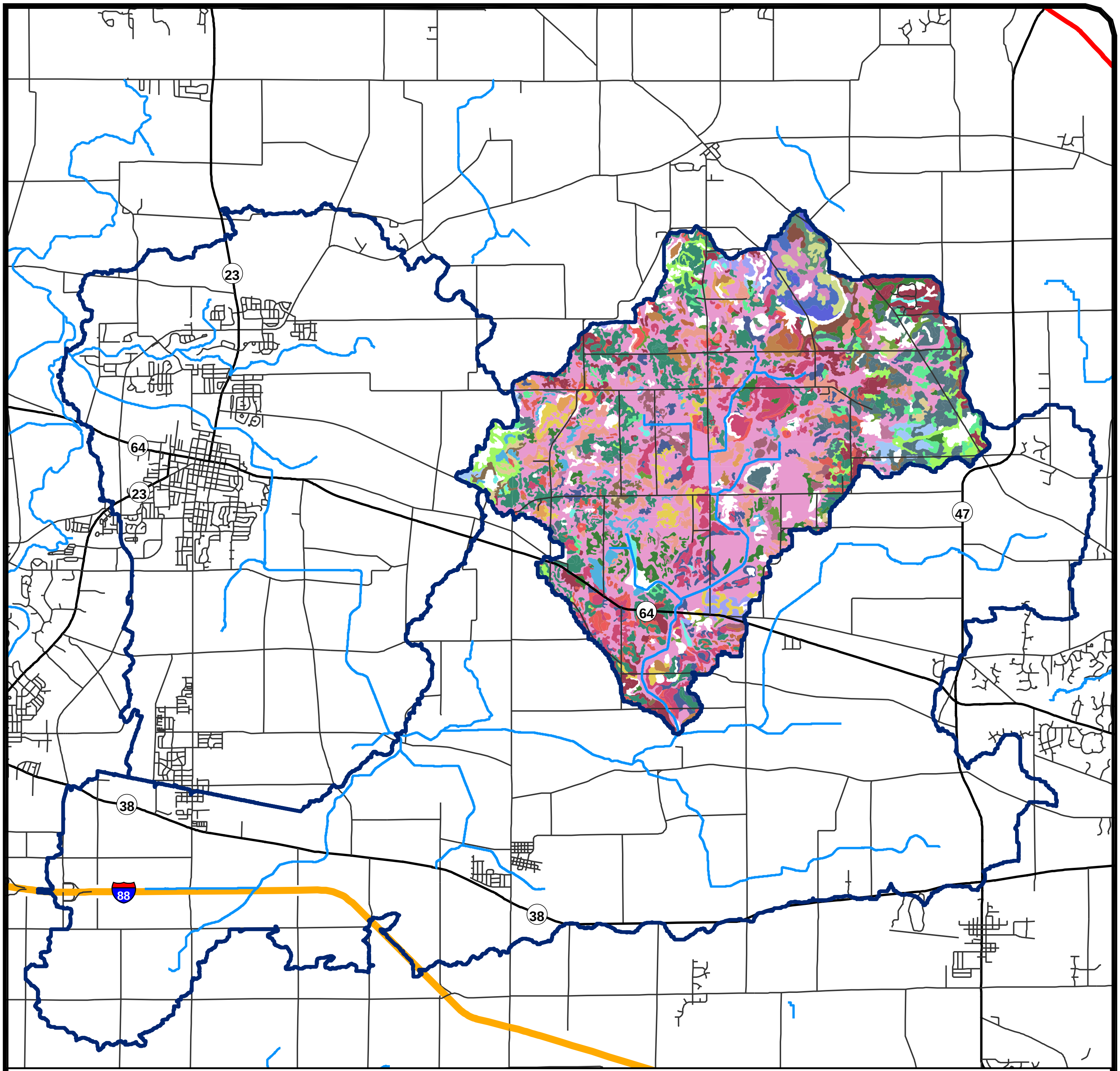
0 0.75 1.5

Miles

1 inch = 10,500 feet

Union-Virgil Ditch
Watershed
Improvement Plan

1-5 - Dominant Soils in the
Union Ditch Subwatershed



Dominant Soil Units

- 59 - Lisbon silt loam
- 62 - Herbert silt loam
- 67 - Harpster silty clay loam
- 103 - Houghton muck
- 104 - Virgil silt loam
- 134 - Camden silt loam
- 149 - Brenton silt loam
- 152 - Drummer silty clay loam
- 154 - Flanagan silt loam
- 193 - Mayville silt loam
- 198 - Elburn silt loam
- 219 - Millbrook silt loam
- 329 - Will loam
- 330 - Peotone silty clay loam
- 343 - Kane sil loam
- 348 - Wingate silt loam
- 356 - Elpaso silty clay loam
- 369 - Waupecan silt loam
- 512 - Danabrook silt loam
- 523 - Dunham silty clay loam
- 526 - Grundelein silt loam
- 527 - Kidami silt loam
- 656 - Octagon silt loam
- 662 - Barony silt loam
- 663 - Clare silt loam
- 667 - Kaneville silt loam
- 668 - Somonauk silt loam
- 680 - Campton silt loam
- 696 - Zurich silt loam
- 697 - Wauconda silt loam
- 791 - Rush silt loam
- 792 - Bowes silt loam

(non-dominant soil units are white)

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Legend

- Watershed Boundary
- Rivers & Streams
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets

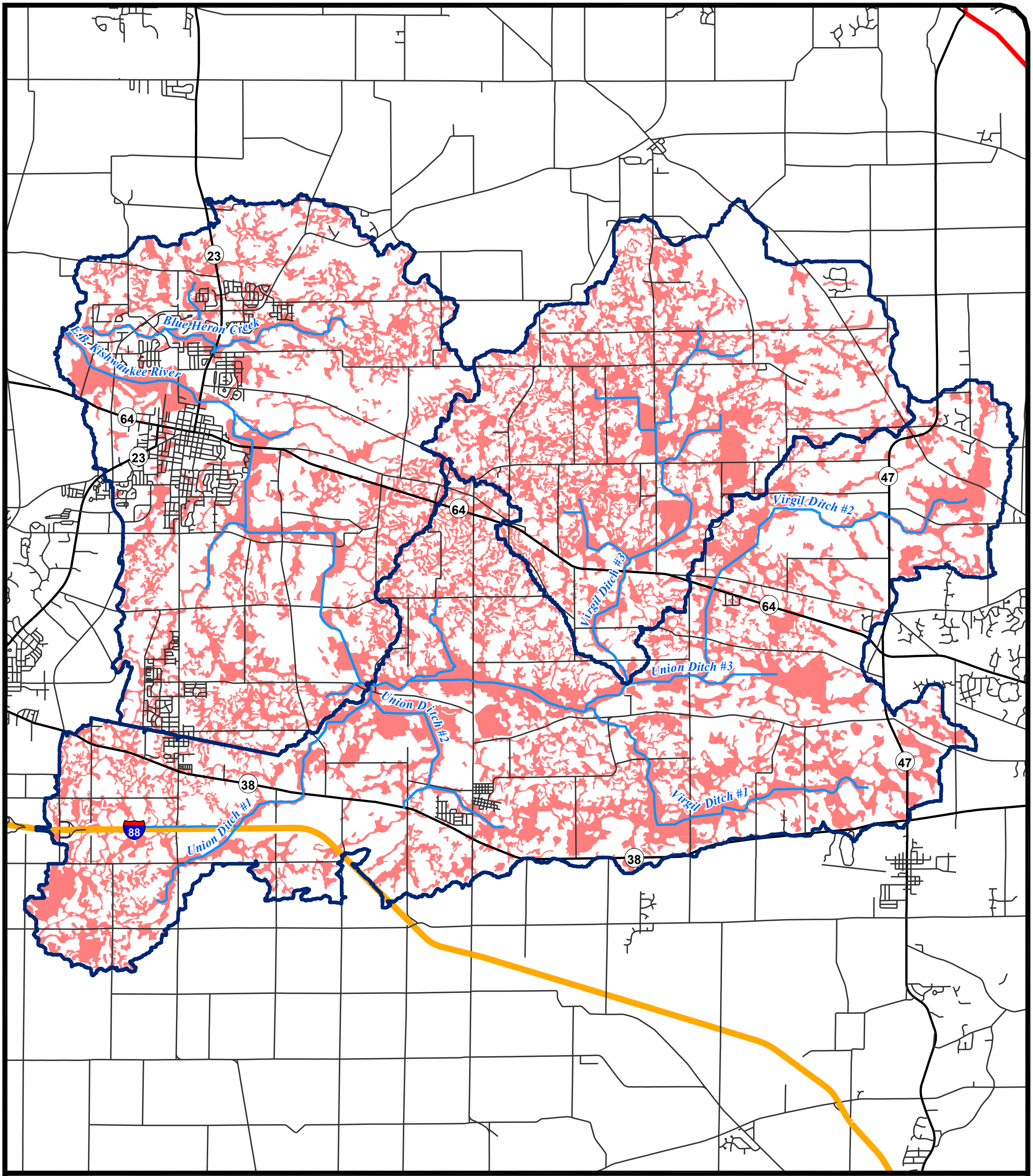
0 0.75 1.5
Miles

N E S W

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-6 - Dominant Soils in the Virgil Ditch Subwatershed



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Legend

- 🟥 Hydric Soils
- ☐ Watershed Boundary
- — Rivers & Streams
- — Interstate/Tollway
- — U.S. Highway
- — State Highway
- — Streets

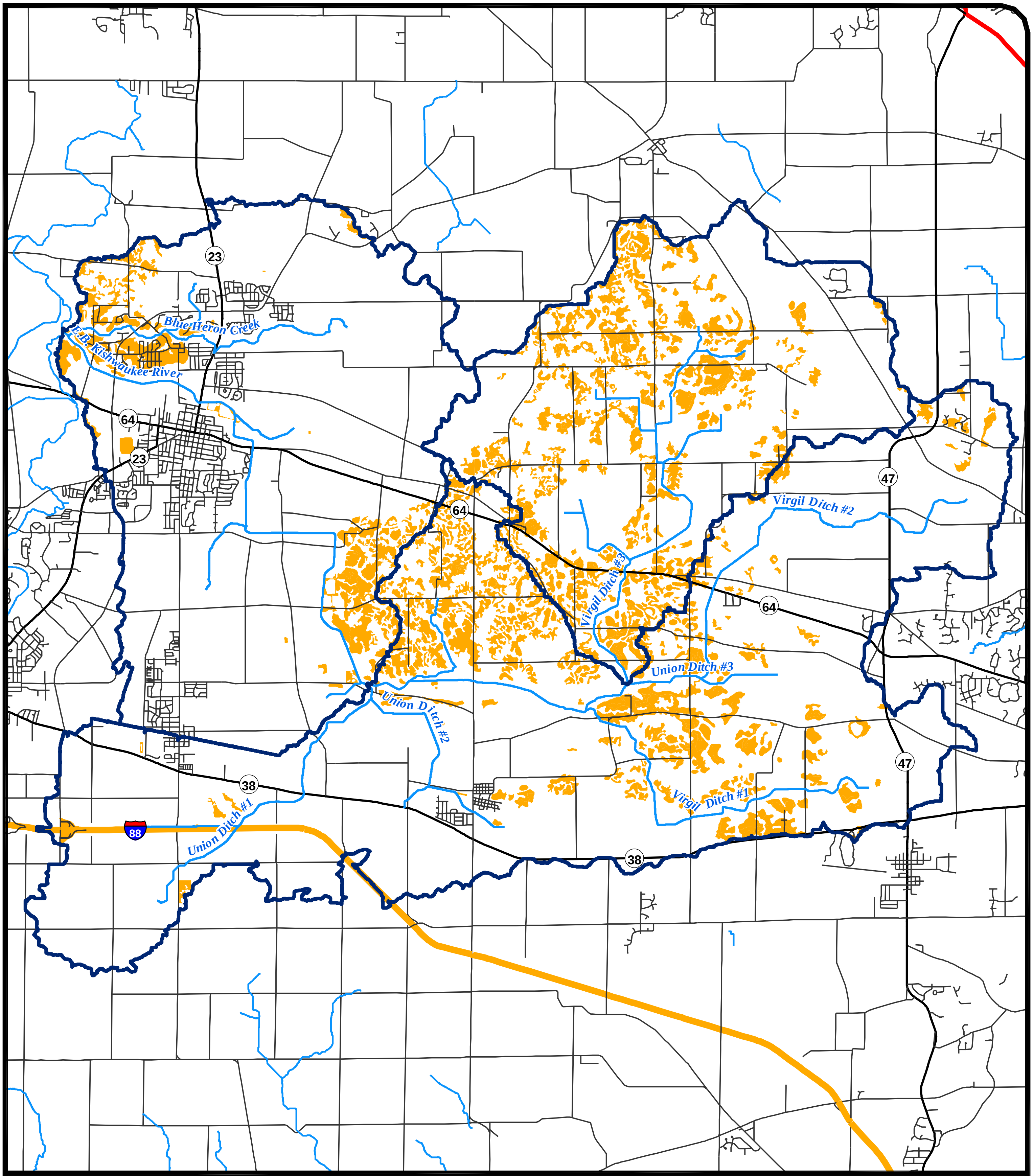
0 0.75 1.5
Miles

N E S W

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-7 - Hydric Soils



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Legend

- 🟧 Highly Erodible Soils
- ▭ Watershed Boundary
- — Rivers & Streams
- — Interstate/Tollway
- — U.S. Highway
- — State Highway
- — Streets

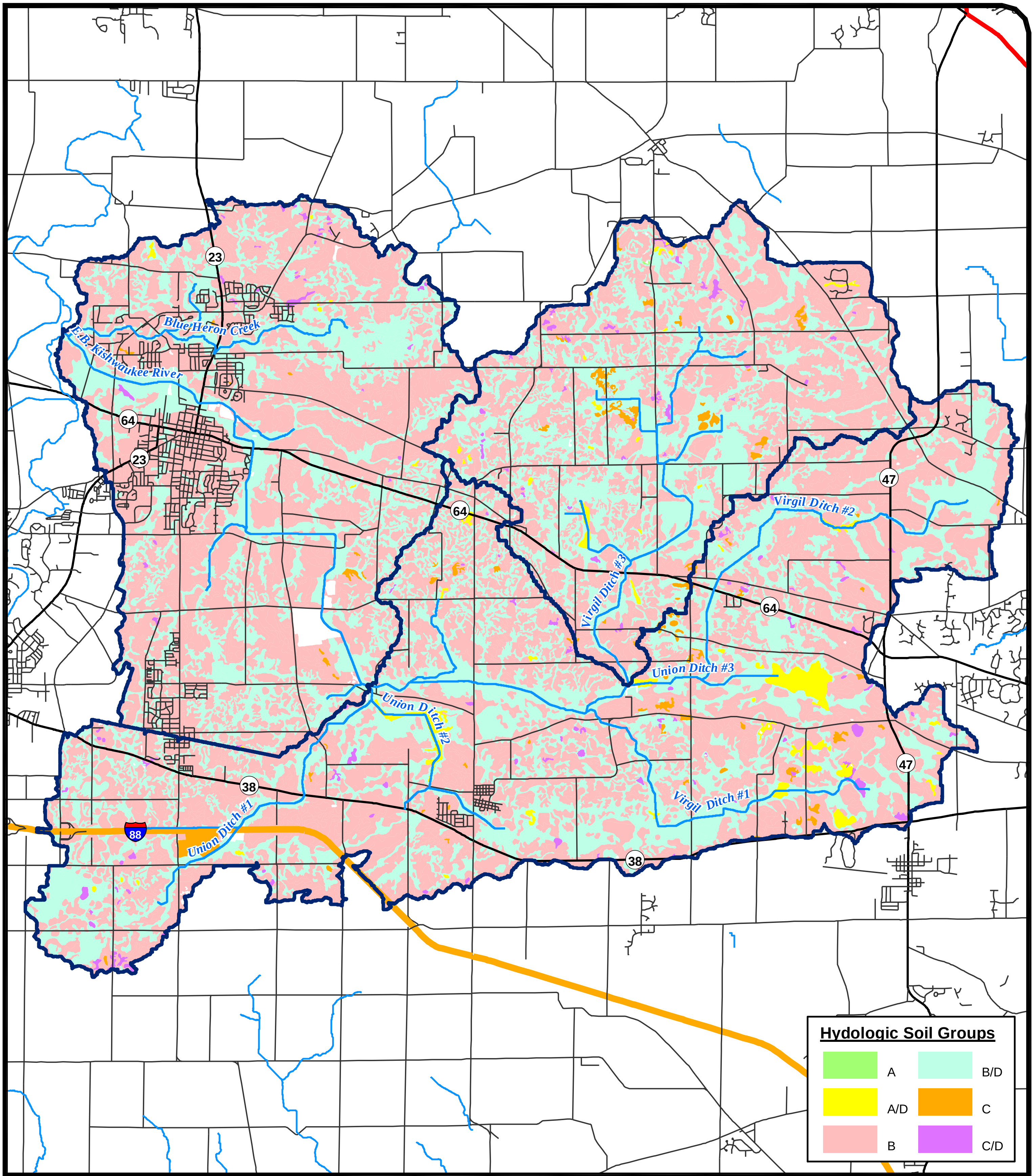
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-8 - Highly Erodible Soils



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Legend

- Watershed Boundary
- Rivers & Streams
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets

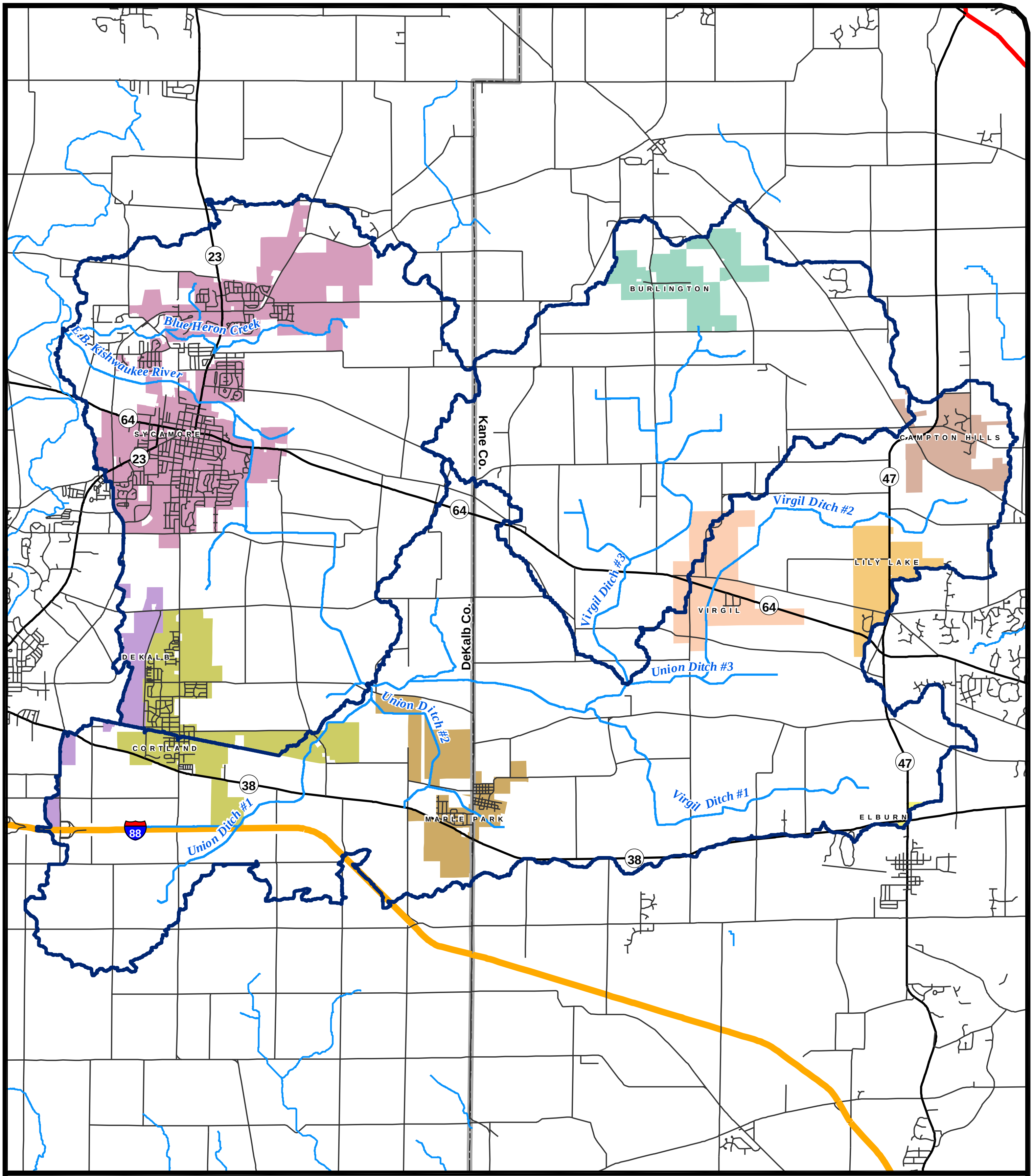
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-9 - Hydrologic Soil Groups



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Legend

- Watershed Boundary
- Rivers & Streams
- County Boundary
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets

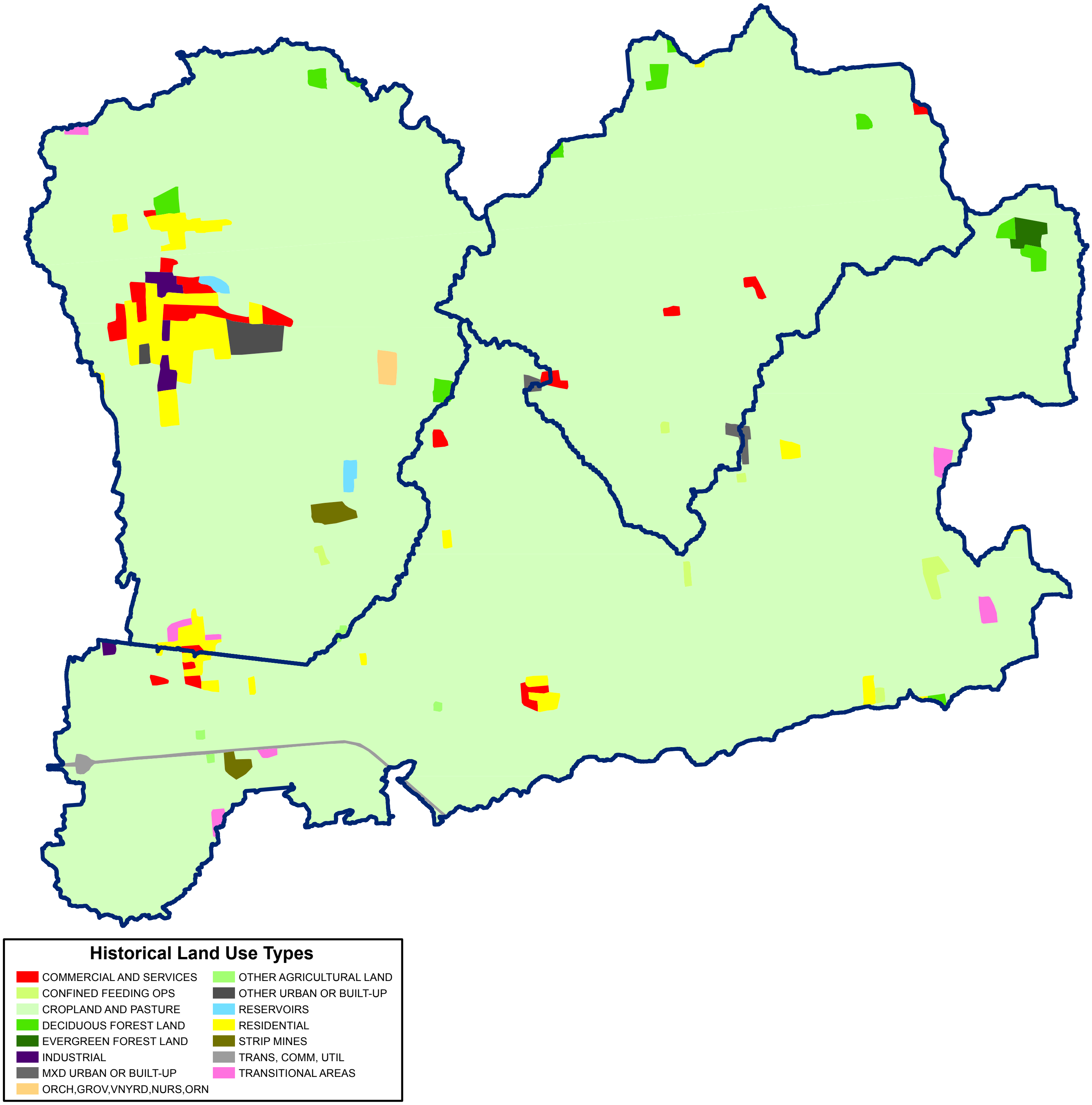
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-10 - Jurisdictions



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Legend

▭ Watershed Boundary

0 0.25 0.5

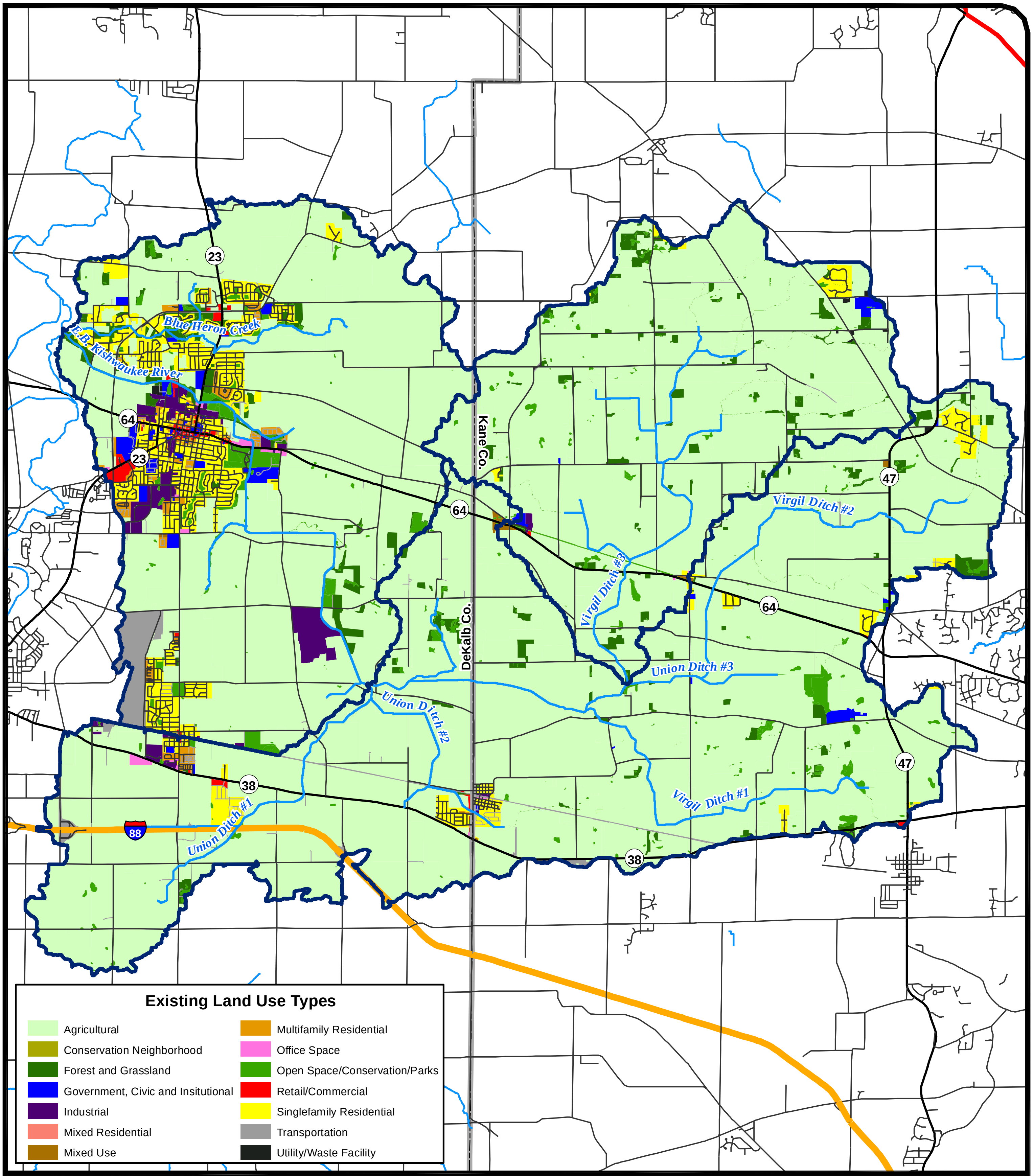
Miles

N
W E
S

1 inch = 3,200 feet

Union-Virgil Ditch Watershed Improvement Plan

3-11 - Historical (GIRAS) Land Use



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Legend

- Watershed Boundary
- Rivers & Streams
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets
- County Boundary

0 0.75 1.5

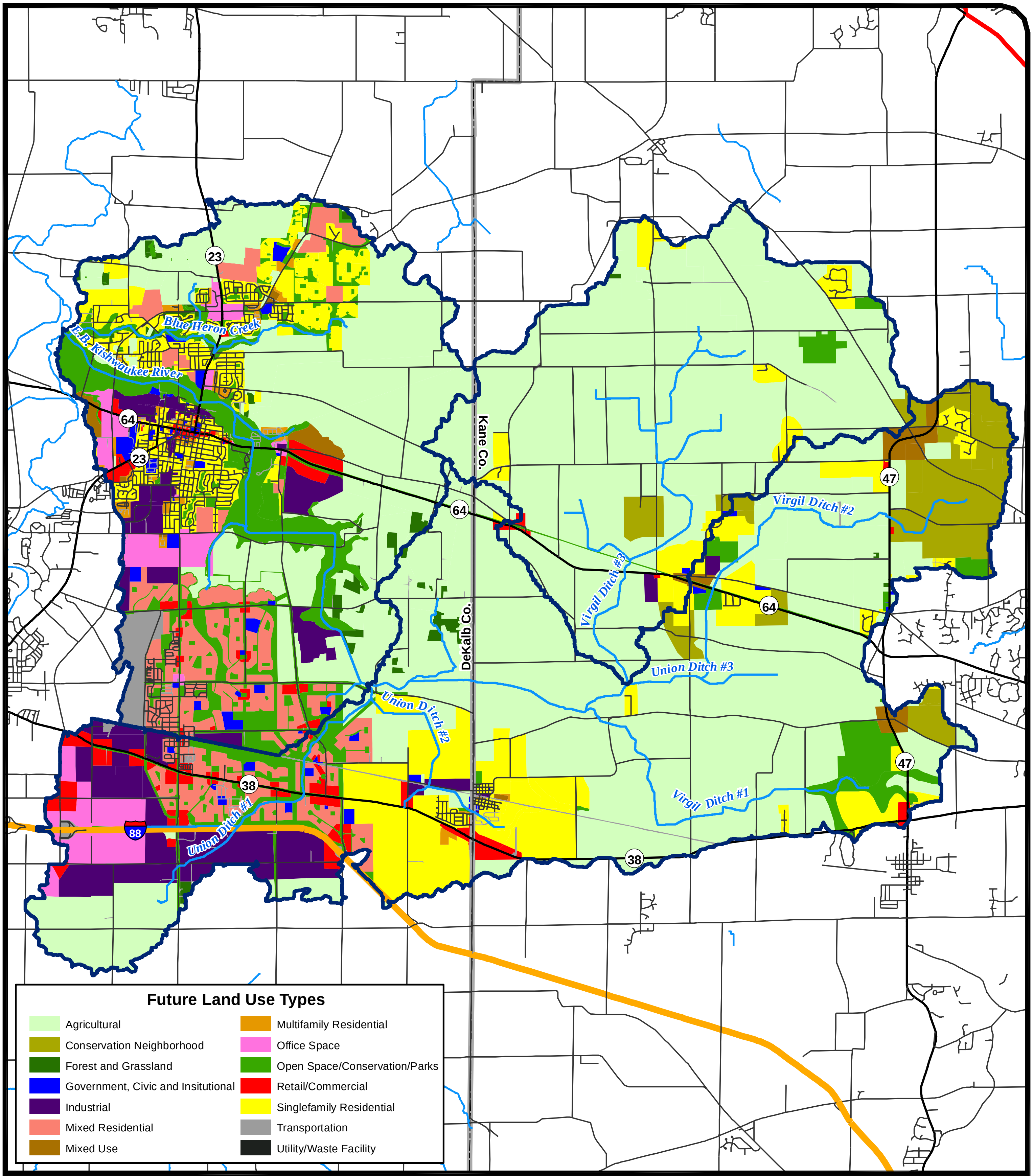
Miles

N E S W

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-12 - Existing Land Use



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Legend

- Watershed Boundary
- Rivers & Streams
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets
- County Boundary

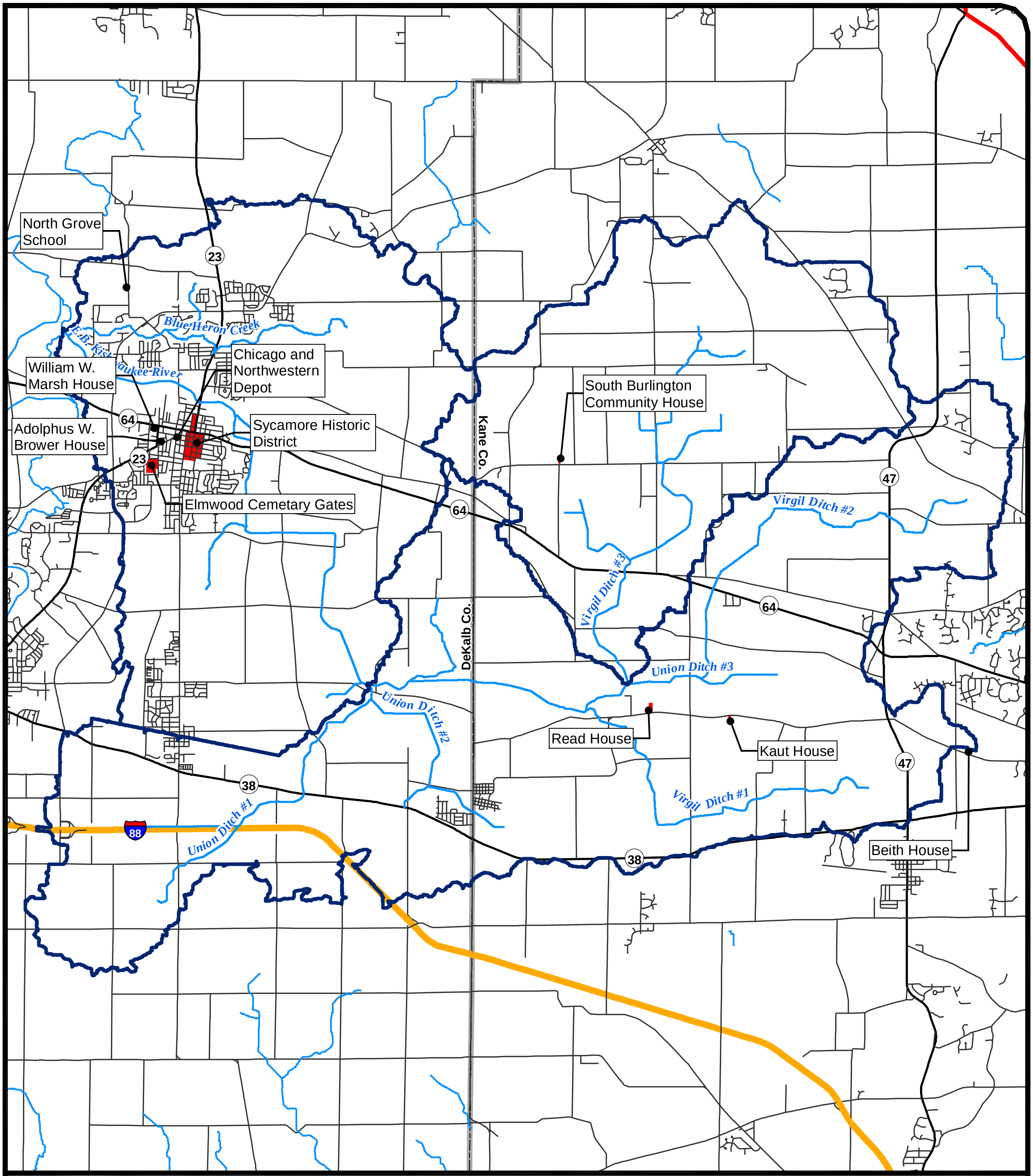
0 0.75 1.5

Miles

1 inch = 10,500 feet

Union-Virgil Ditch
Watershed
Improvement Plan

3-13 - Future Land Use



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Legend

🟥 Historical Places/Districts
▭ Watershed Boundary
― Rivers & Streams
― Interstate/Tollway
― U.S. Highway
― State Highway
― Streets
▭ County Boundary

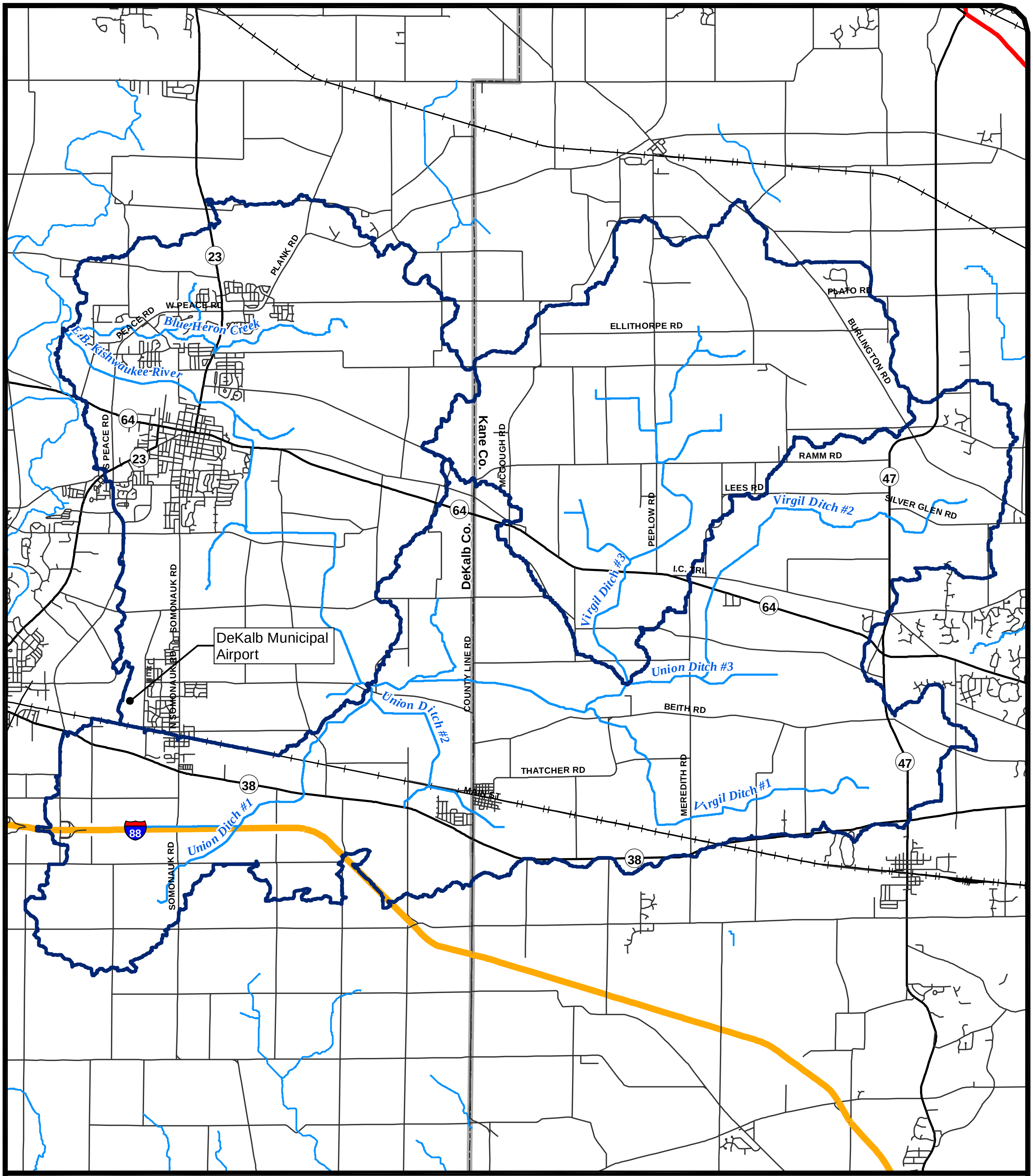
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-14 - Historical Places/Districts



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Legend

- ▭ Watershed Boundary
- ― Rivers & Streams
- ┼ Railroad
- ▬ Interstate/Tollway
- ▬ U.S. Highway
- ― State Highway
- ― Streets
- ▭ County Boundary

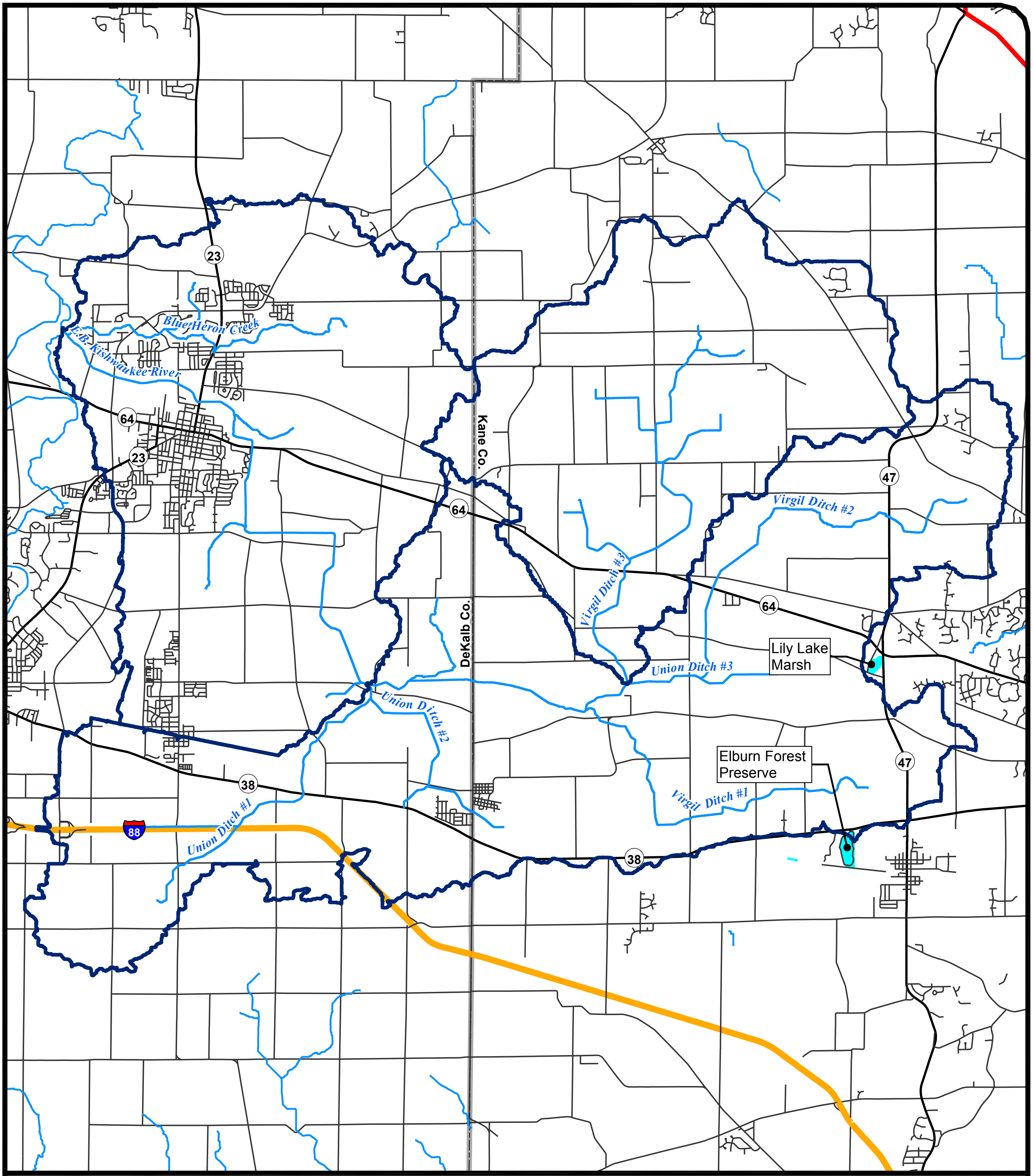
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-15 - Transporation Network



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Legend

- 🟦 INAI Sites
- ▢ Watershed Boundary
- ─ Rivers & Streams
- ─ Interstate/Tollway
- ─ U.S. Highway
- ─ State Highway
- ─ Streets
- ▢ County Boundary

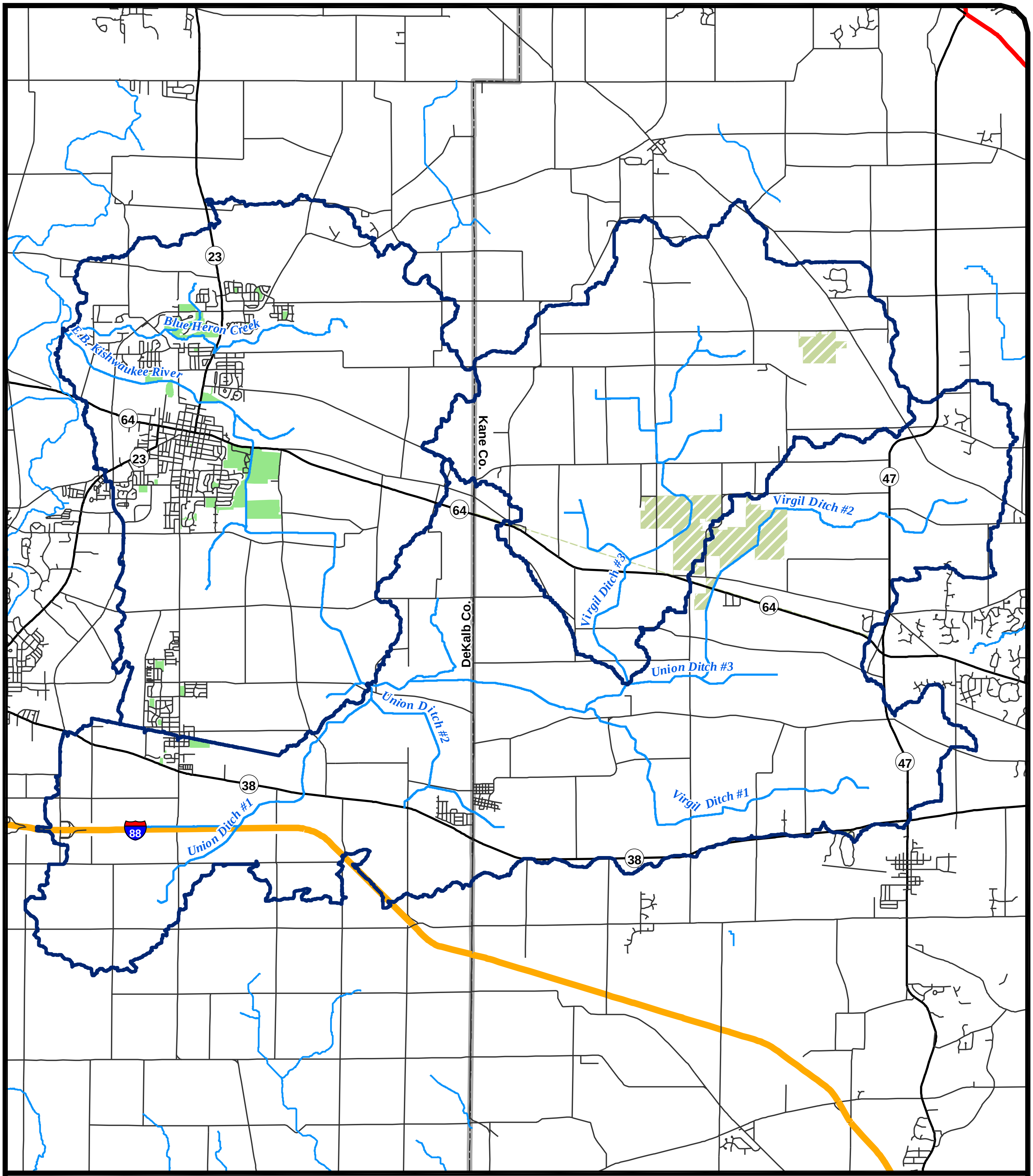
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-16 - Illinois Natural Areas Inventory Sites



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Legend

- 🟩 Parks
- ▨ Forest Preserves
- ▭ Watershed Boundary
- — Rivers & Streams
- — Interstate/Tollway
- — U.S. Highway
- — State Highway
- — Streets
- ▭ County Boundary

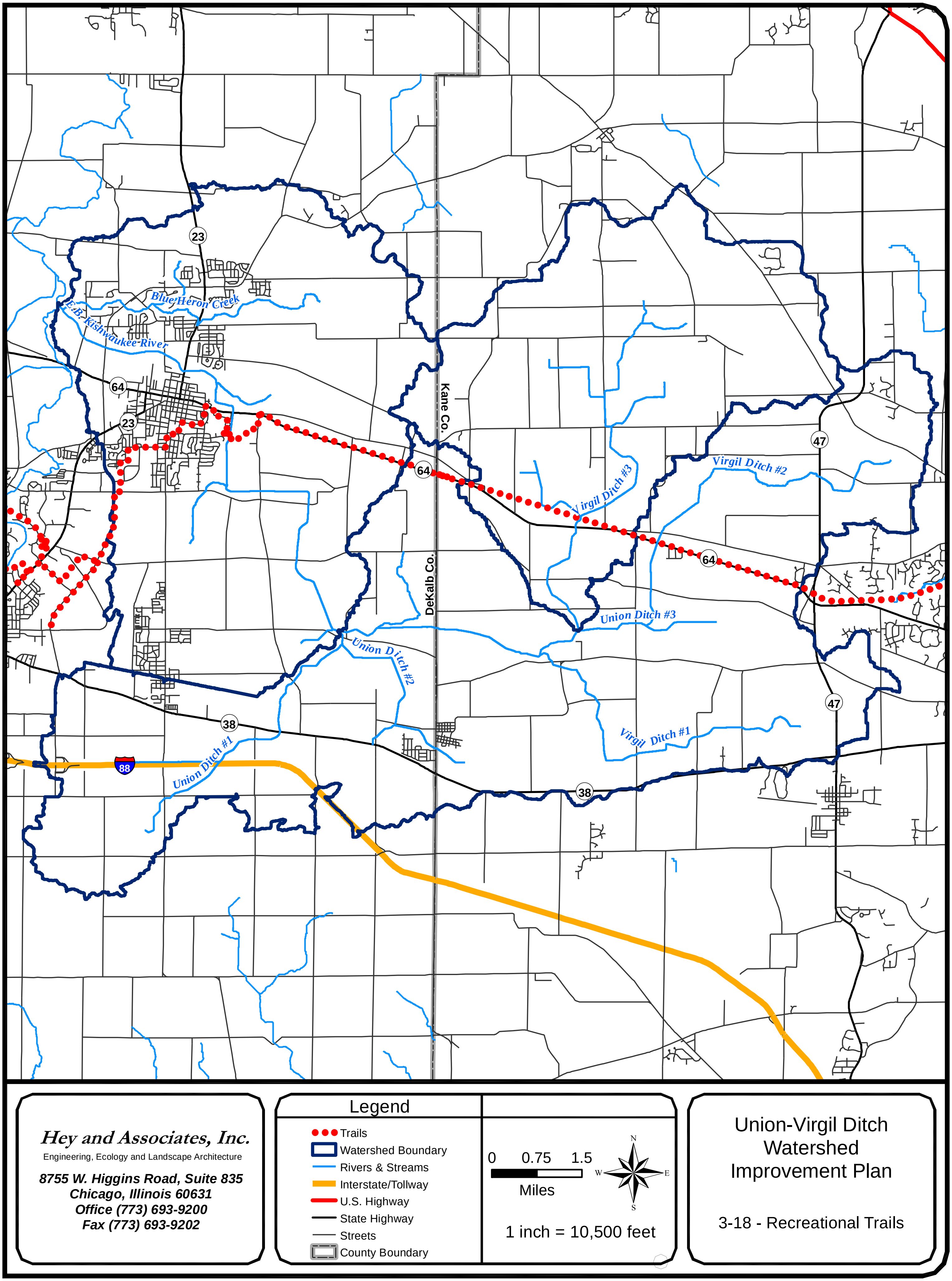
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-17 - Forest Preserves and Parks



1 inch = 10,500 feet

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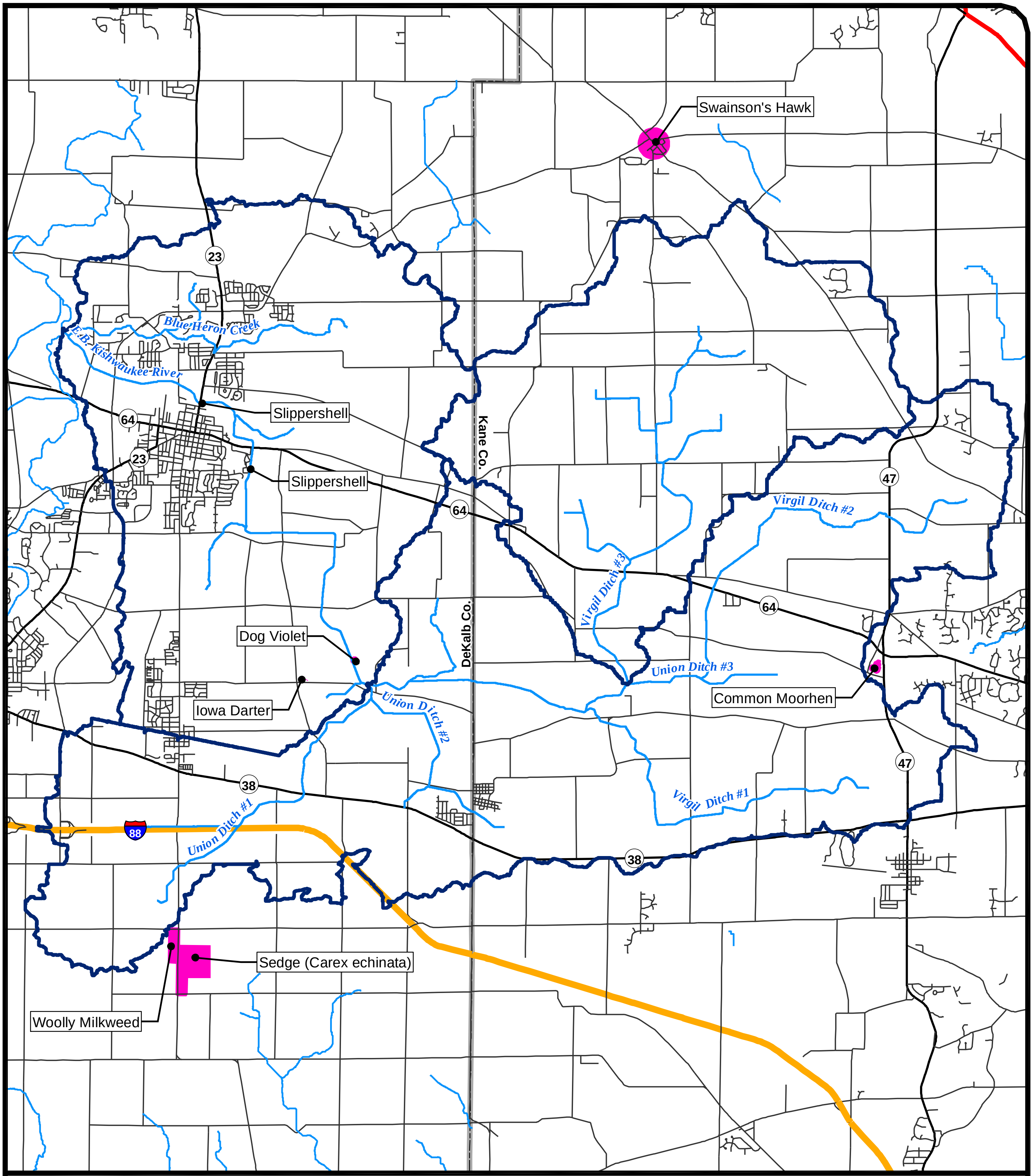
3-18 - Recreational Trails



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Legend

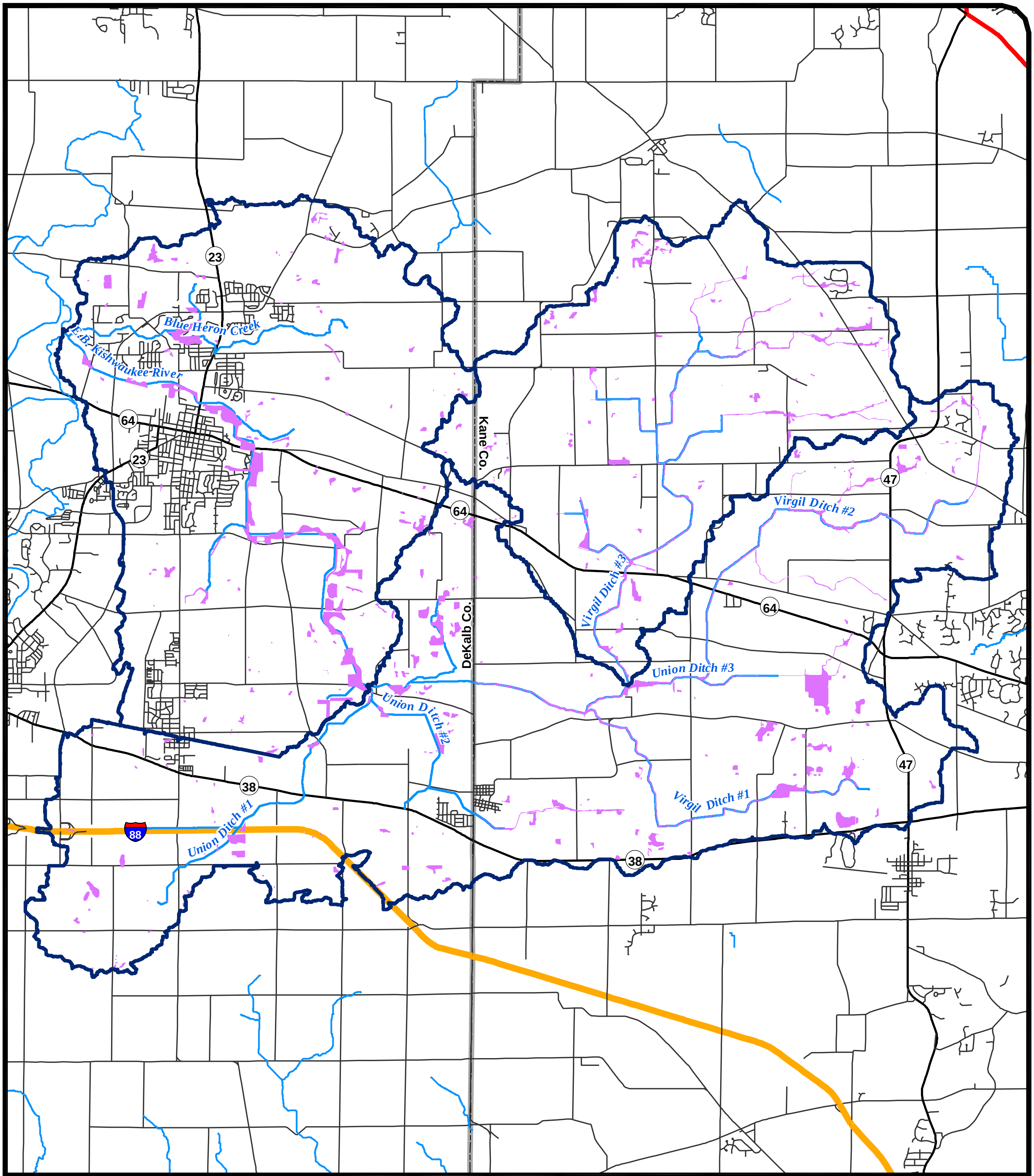
- 🟪 T&E Species
- ▭ Watershed Boundary
- — Rivers & Streams
- — Interstate/Tollway
- — U.S. Highway
- — State Highway
- — Streets
- ▭ County Boundary

0 0.75 1.5
Miles

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-19 - Threatened and Endangered Species Locations



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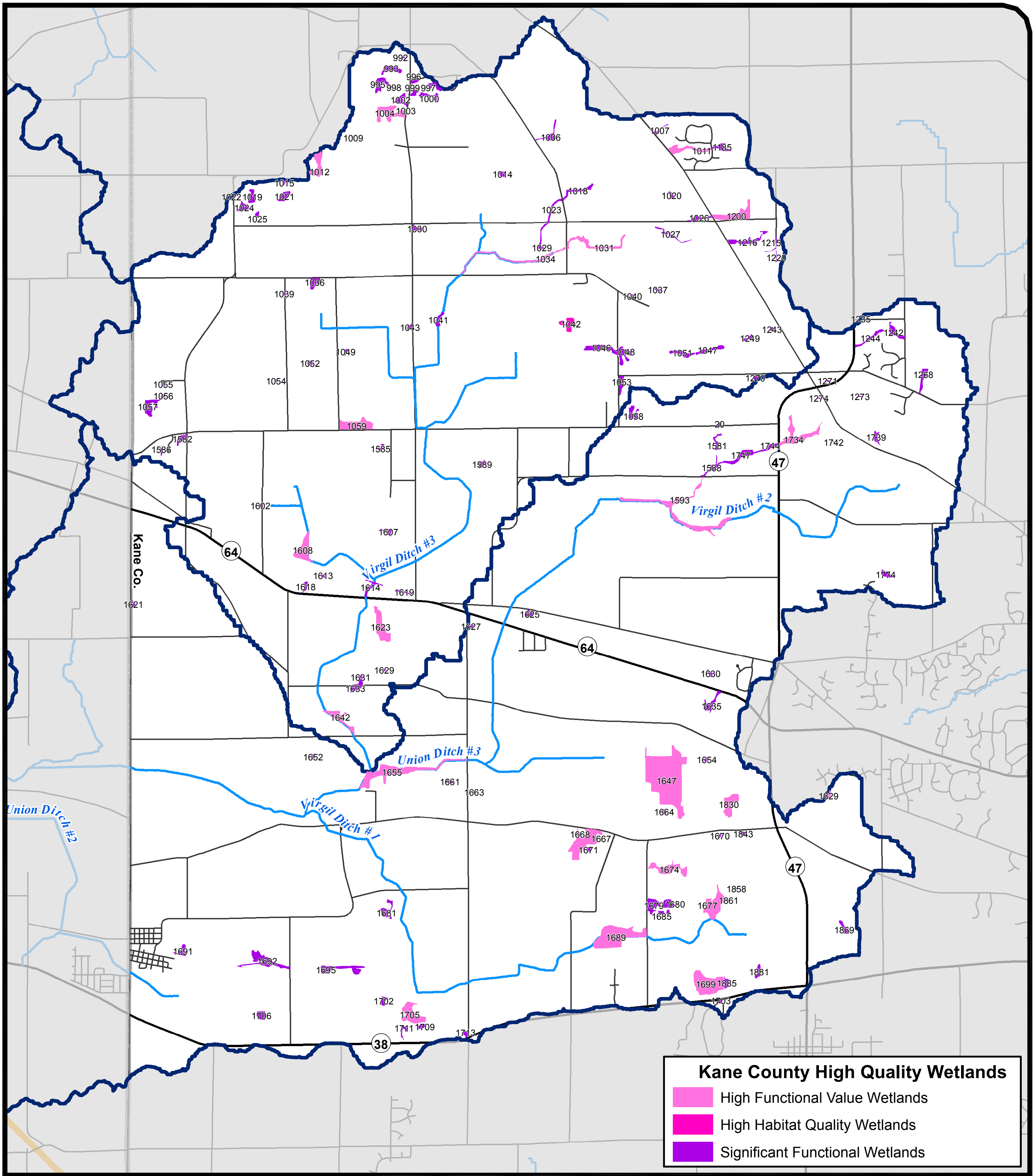
Legend

- 🟪 Wetlands
- ▭ Watershed Boundary
- — Rivers & Streams
- — Interstate/Tollway
- — U.S. Highway
- — State Highway
- — Streets
- ▭ County Boundary

0 0.75 1.5
Miles
1 inch = 10,500 feet

Union-Virgil Ditch
Watershed
Improvement Plan

3-20 - Wetlands



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Legend

▭	Watershed Boundary
—	Rivers & Streams
—	Interstate/Tollway
—	U.S. Highway
—	State Highway
—	Streets
▭	County Boundary

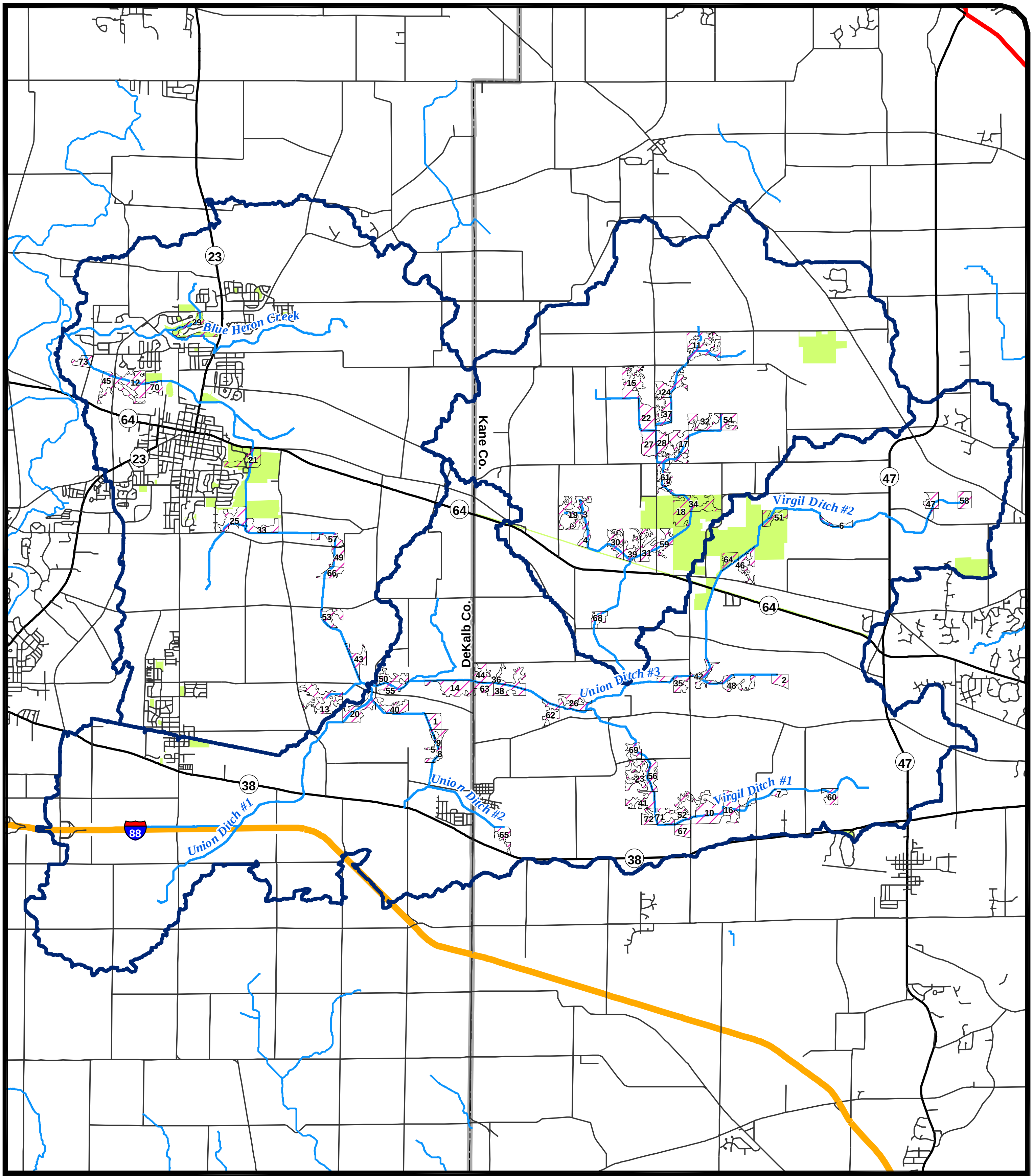
0 0.5 1
Miles

N
W E
S

1 inch = 6,750 feet

Union-Virgil Ditch Watershed Improvement Plan

3-21 - High Quality Wetlands in Kane County



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Legend

▨ Potential Wetland Restoration Sites
🟩 Public Openspace
▭ Watershed Boundary
— Rivers & Streams
— Interstate/Tollway
— U.S. Highway
— State Highway
— Streets
▭ County Boundary

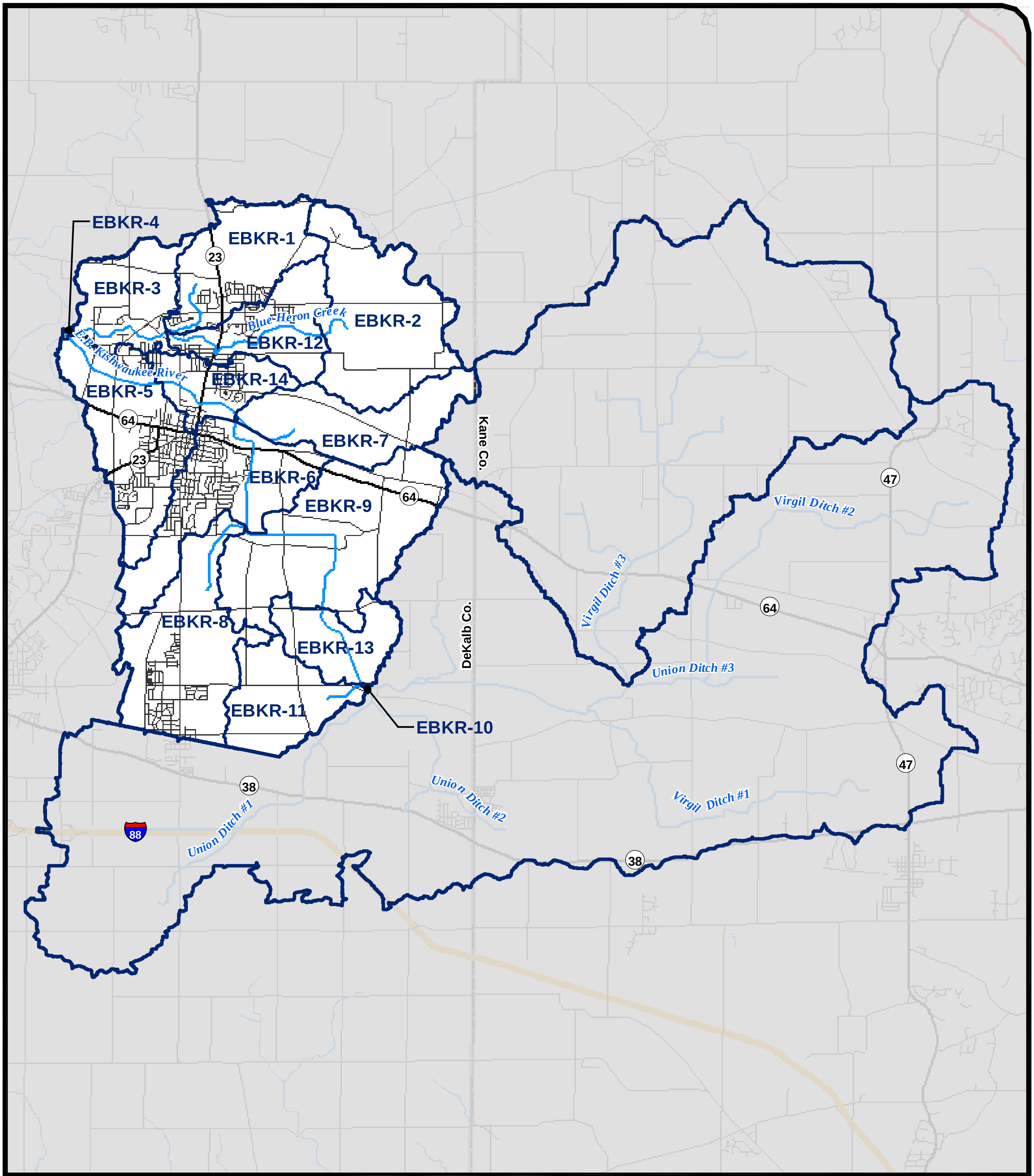
0 0.75 1.5
Miles

N E S W

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-22 - Potential Wetland Restoration Sites



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Legend

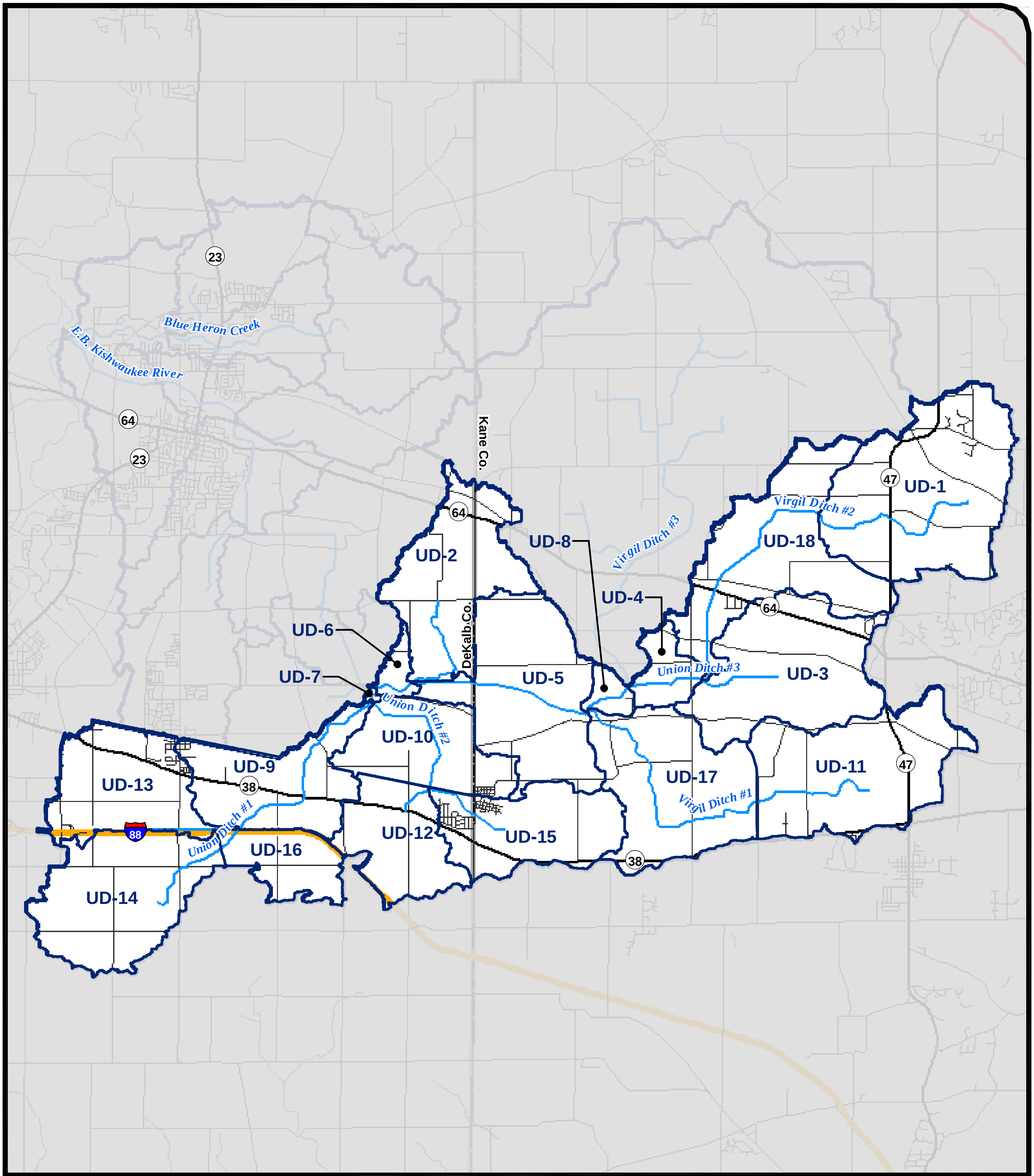
▭	Watershed Boundary
—	Rivers & Streams
—	Interstate/Tollway
—	U.S. Highway
—	State Highway
—	Streets
▭	County Boundary

0 0.75 1.5
Miles

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-23 - Stormwater Management Units in the East Branch Kiswaukee River Subwatershed



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Legend

▭	Watershed Boundary
─	Rivers & Streams
▬	Interstate/Tollway
▬	U.S. Highway
─	State Highway
─	Streets
▭	County Boundary

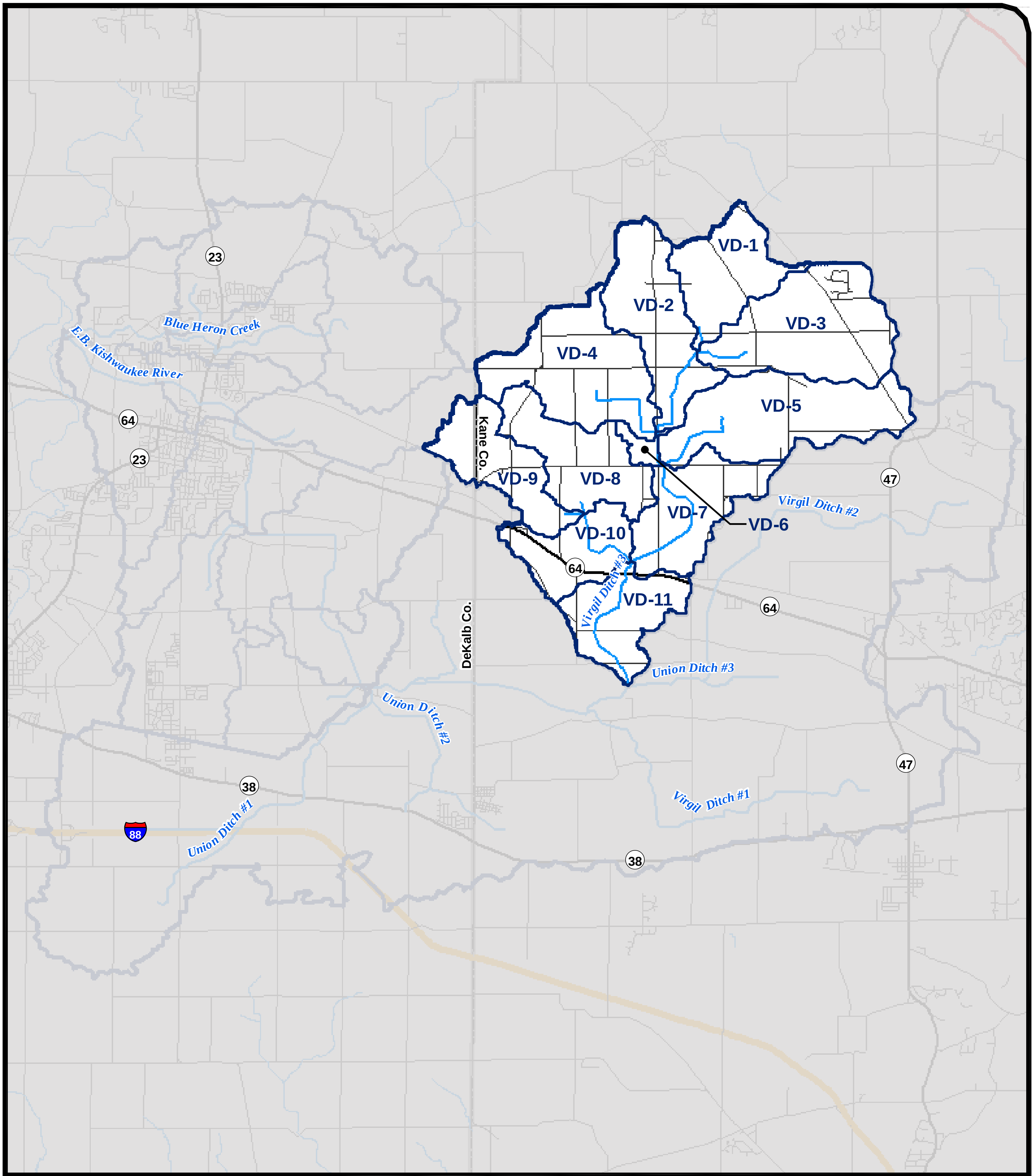
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-24 - Stormwater Management Units in the Union Ditch Subwatershed



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Legend

▭	Watershed Boundary
—	Rivers & Streams
—	Interstate/Tollway
—	U.S. Highway
—	State Highway
—	Streets
▭	County Boundary

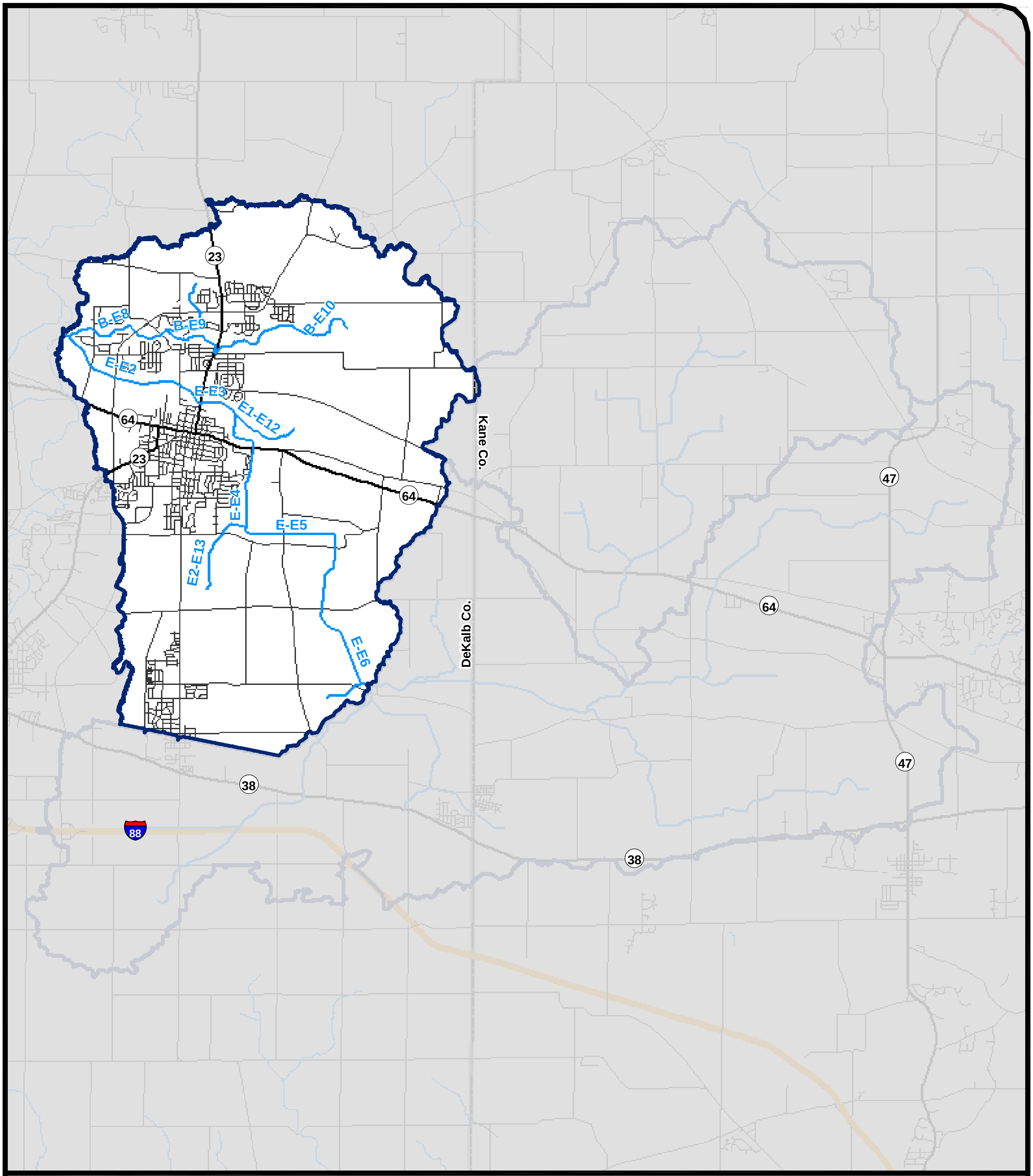
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-25 - Stormwater Management Units in the Virgil Ditch Subwatershed



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Legend

▭	Watershed Boundary
—	Rivers & Streams
—	Interstate/Tollway
—	U.S. Highway
—	State Highway
—	Streets
▭	County Boundary

0 0.75 1.5

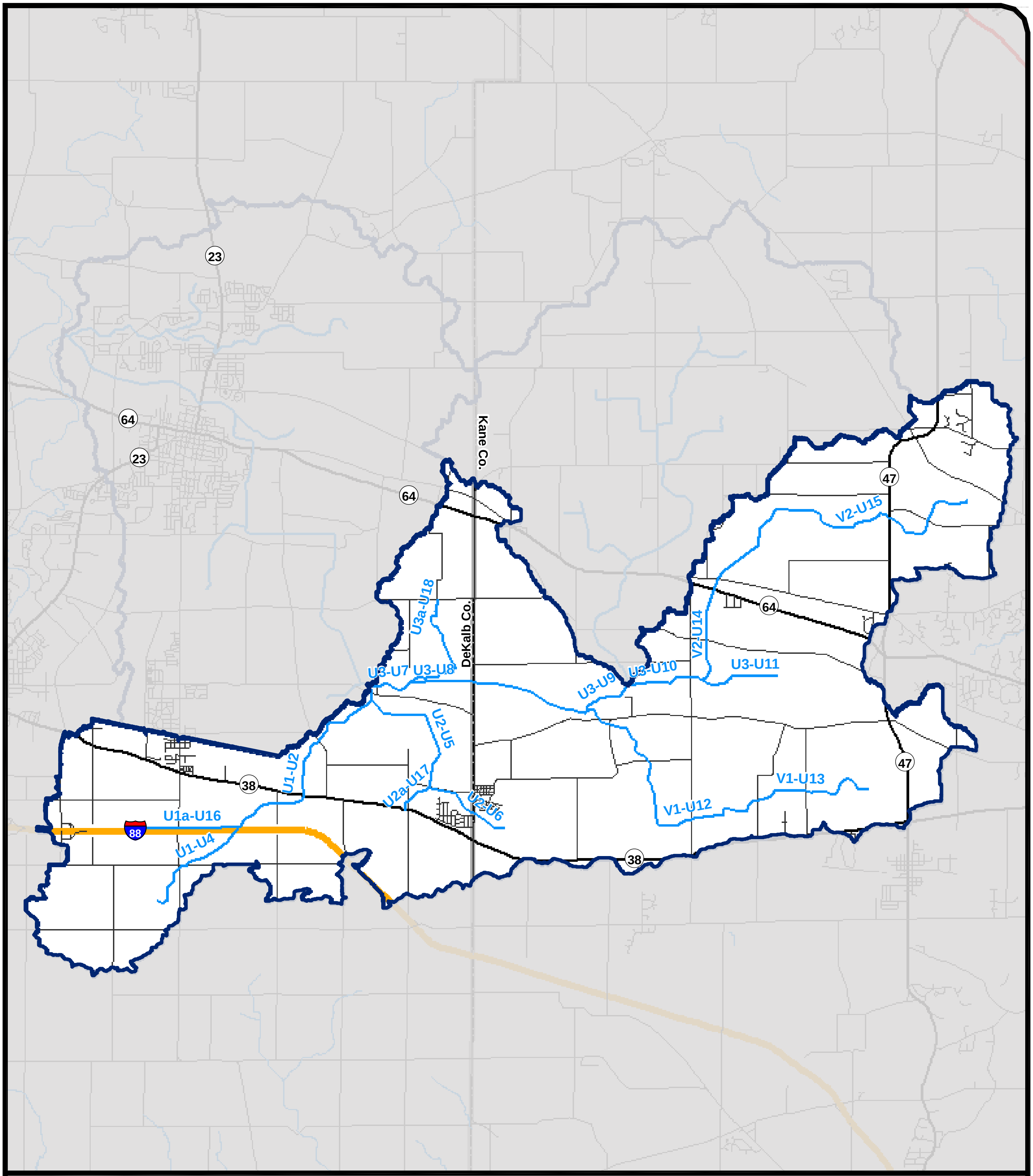
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-26 - Stream Reaches in the East Branch Kiswaukee River Subwatershed



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Legend

- ▭ Watershed Boundary
- — Rivers & Streams
- — Interstate/Tollway
- — U.S. Highway
- — State Highway
- — Streets
- ▭ County Boundary

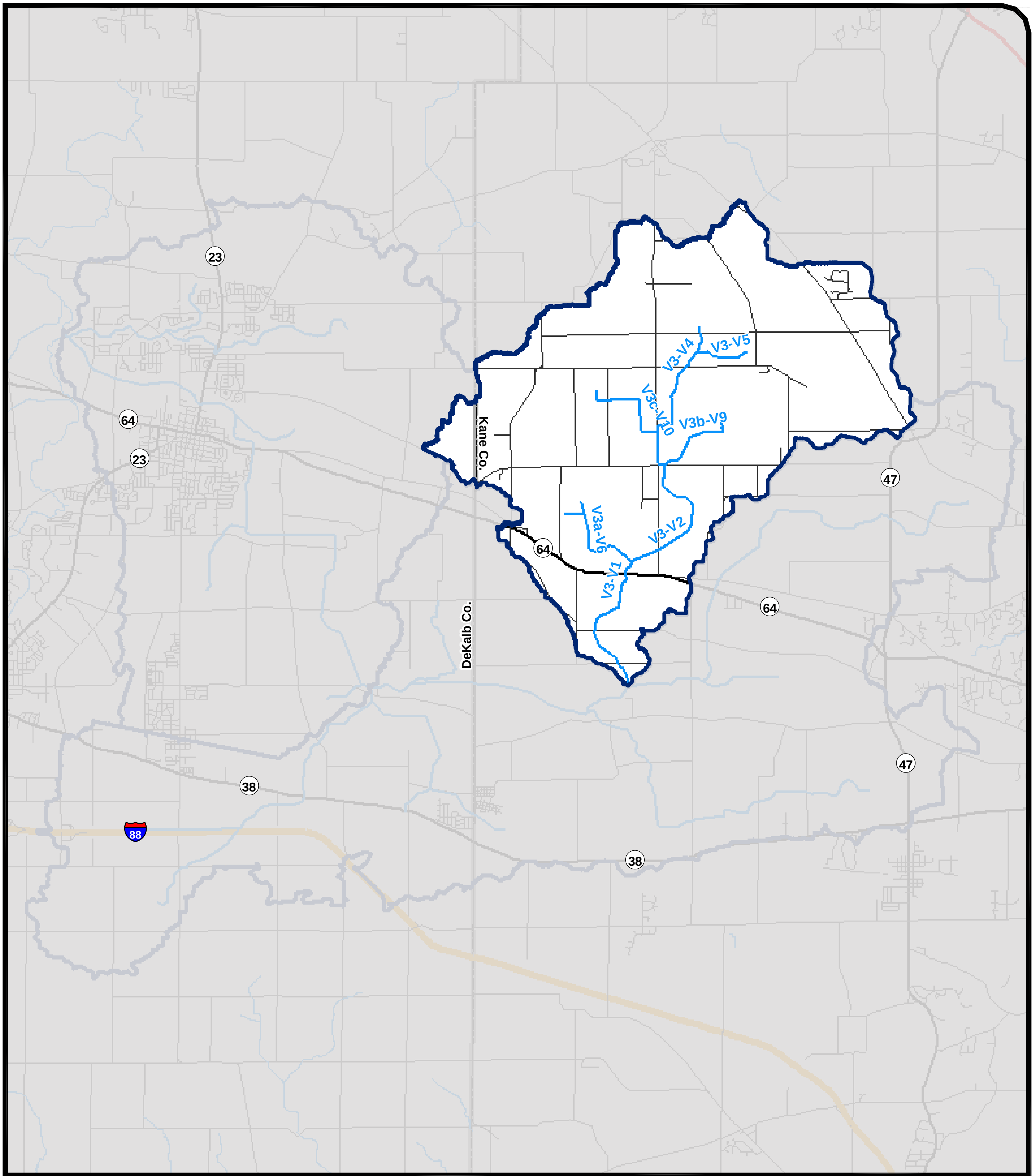
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-27 - Stream Reaches in the Union Dtich Subwatershed



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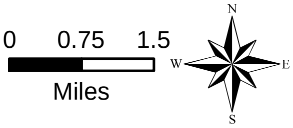
Legend

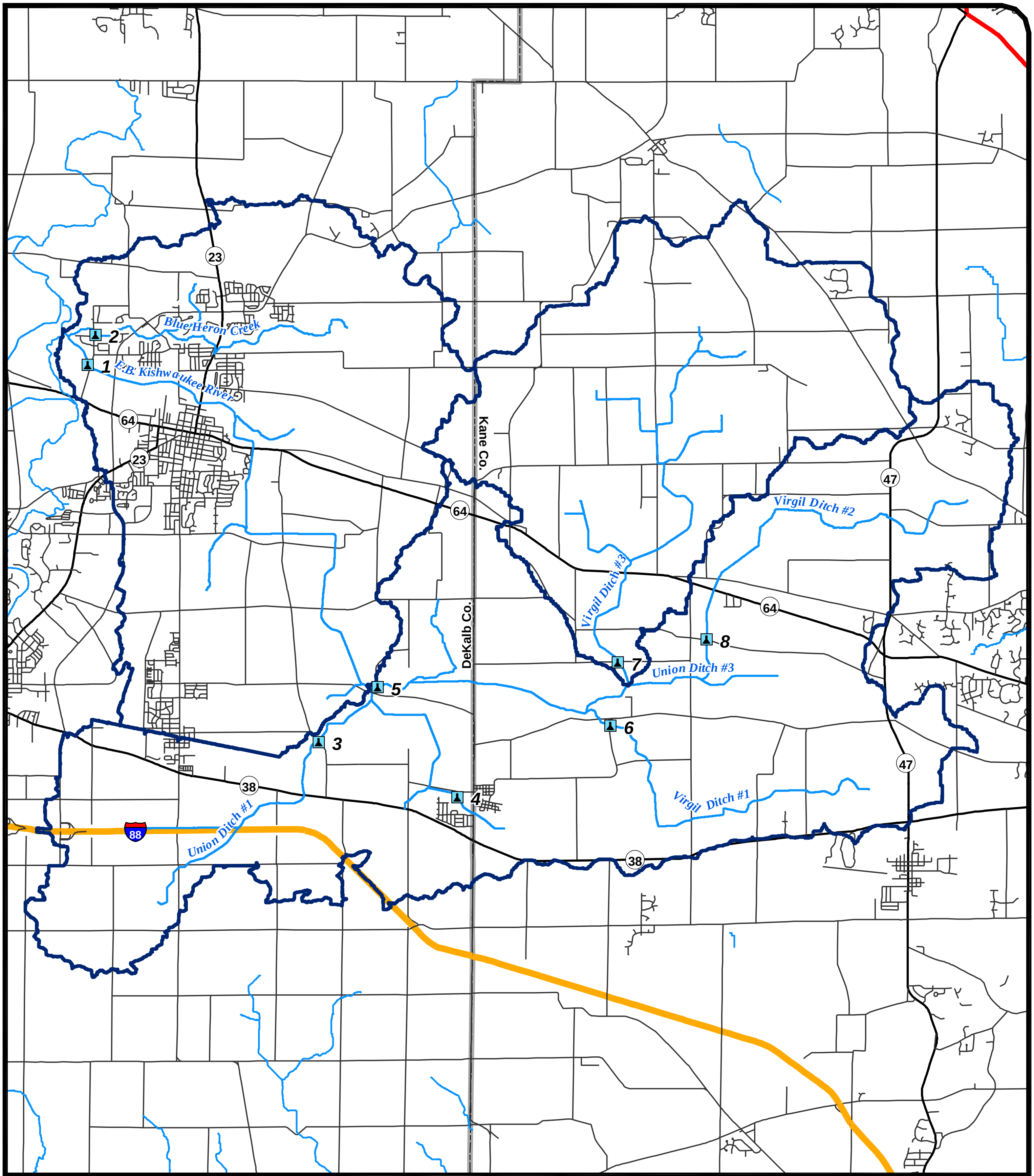
- Watershed Boundary
- Rivers & Streams
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets
- County Boundary



1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-28 - Stream Reaches in the Virgil Dtich Subwatershed



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Legend

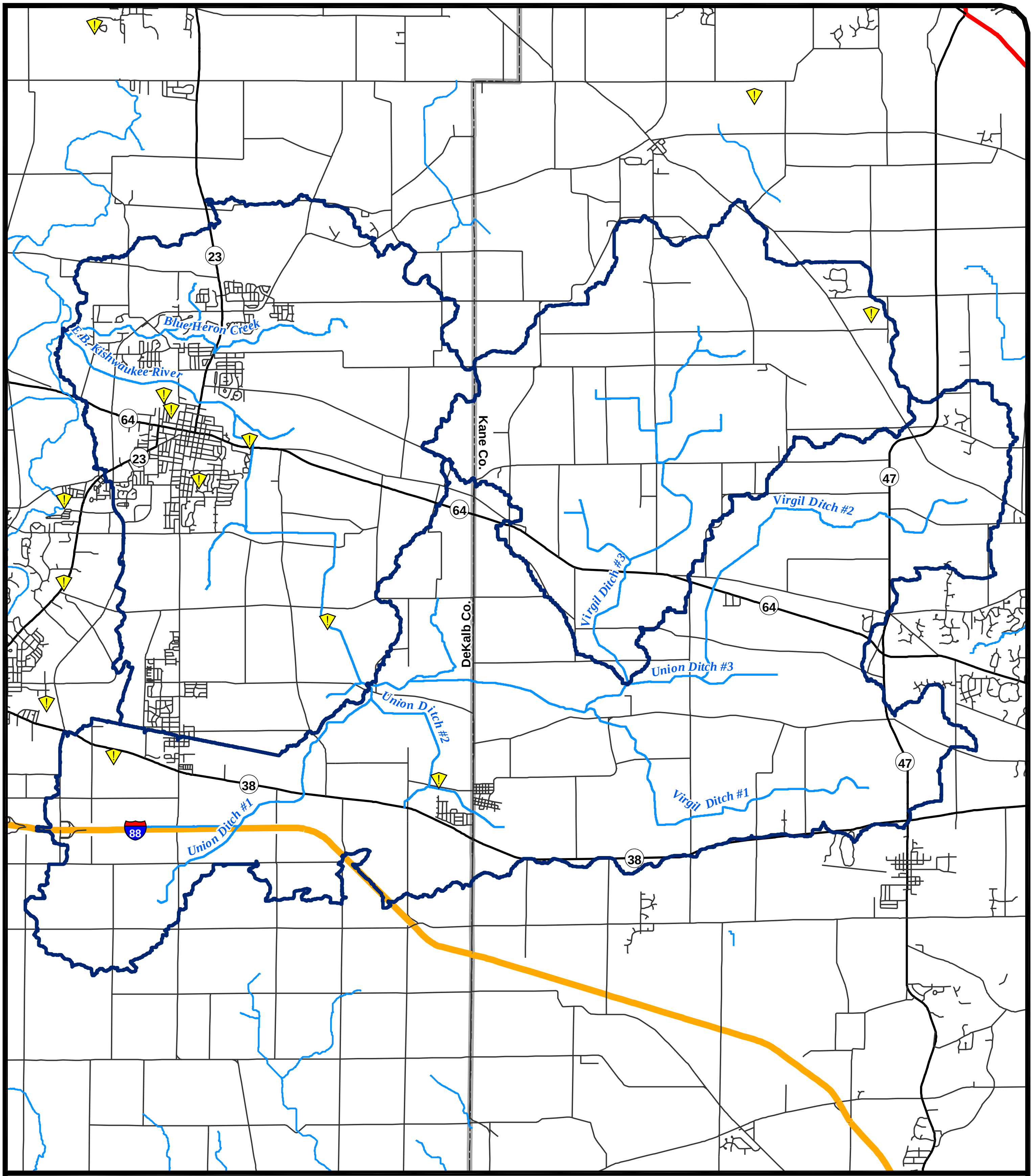
- Sampling Sites
- Watershed Boundary
- Rivers & Streams
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets
- County Boundary

0 0.75 1.5
Miles

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-29 - Sampling Sites



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Legend

⚠	Point Source Discharges
▭	Watershed Boundary
—	Rivers & Streams
—	Interstate/Tollway
—	U.S. Highway
—	State Highway
—	Streets
▭	County Boundary

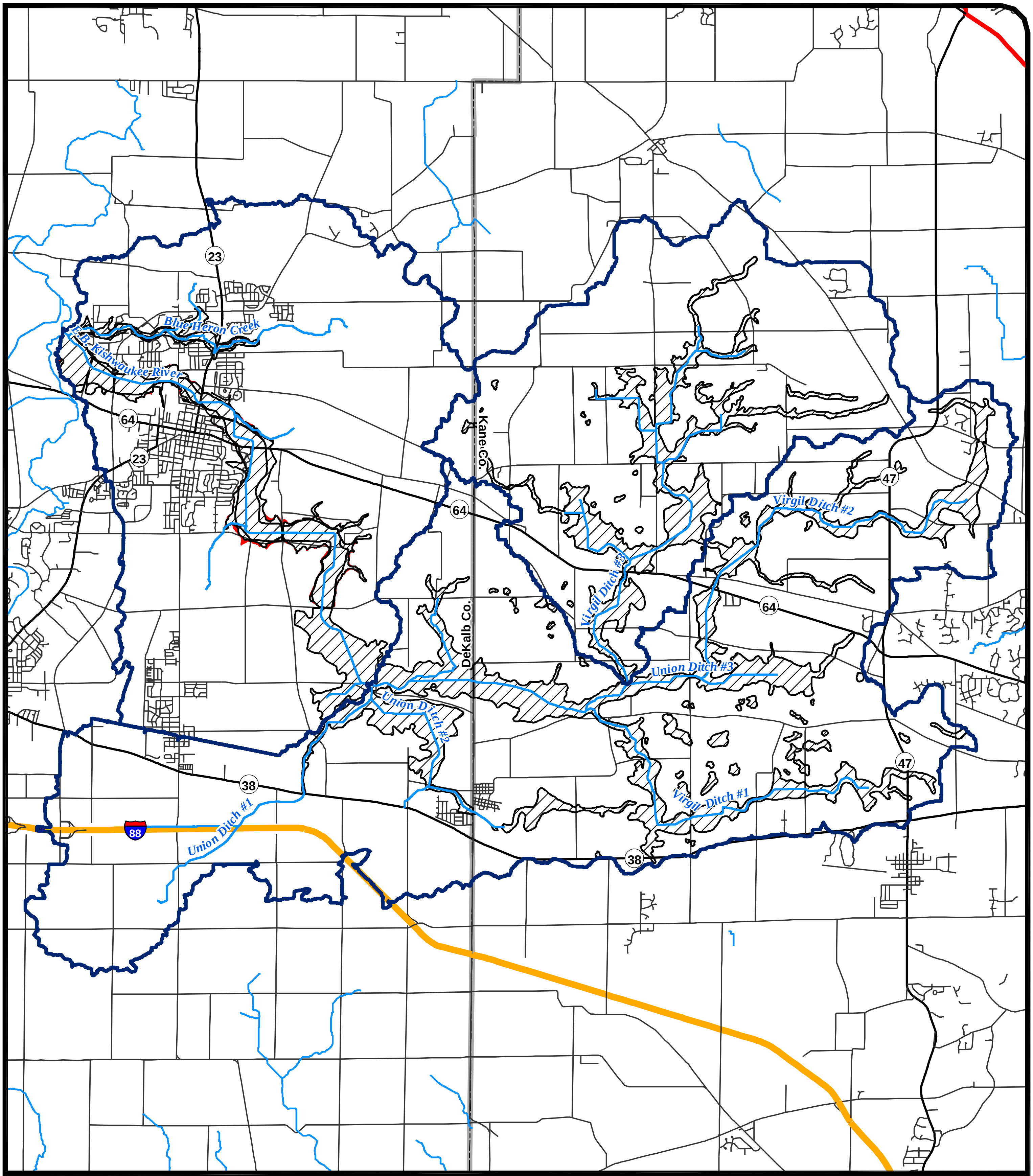
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-30 - NPDES Point Source Discharges for Municipal and Industrial Effluent Locations



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Legend

- ▨ 100 YR Floodplain
- 🟥 500 YR Floodplain
- ▢ Watershed Boundary
- ― Rivers & Streams
- ― Interstate/Tollway
- ― U.S. Highway
- ― State Highway
- ― Streets
- ▢ County Boundary

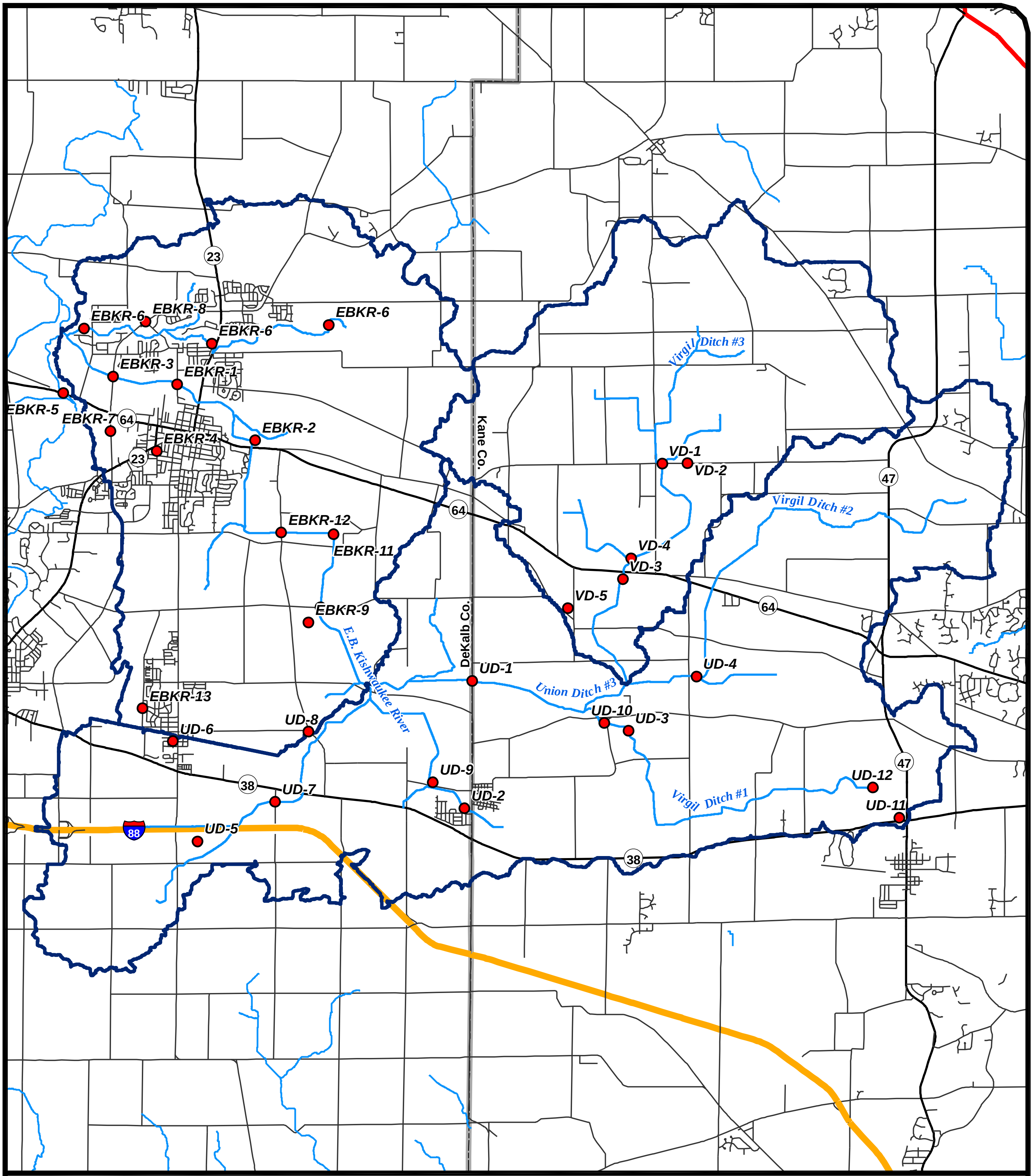
0 0.75 1.5

Miles

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-31 - Floodplain



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Legend

● Problem Areas
▭ Watershed Boundary
— Rivers & Streams
— Interstate/Tollway
— U.S. Highway
— State Highway
— Streets
▭ County Boundary

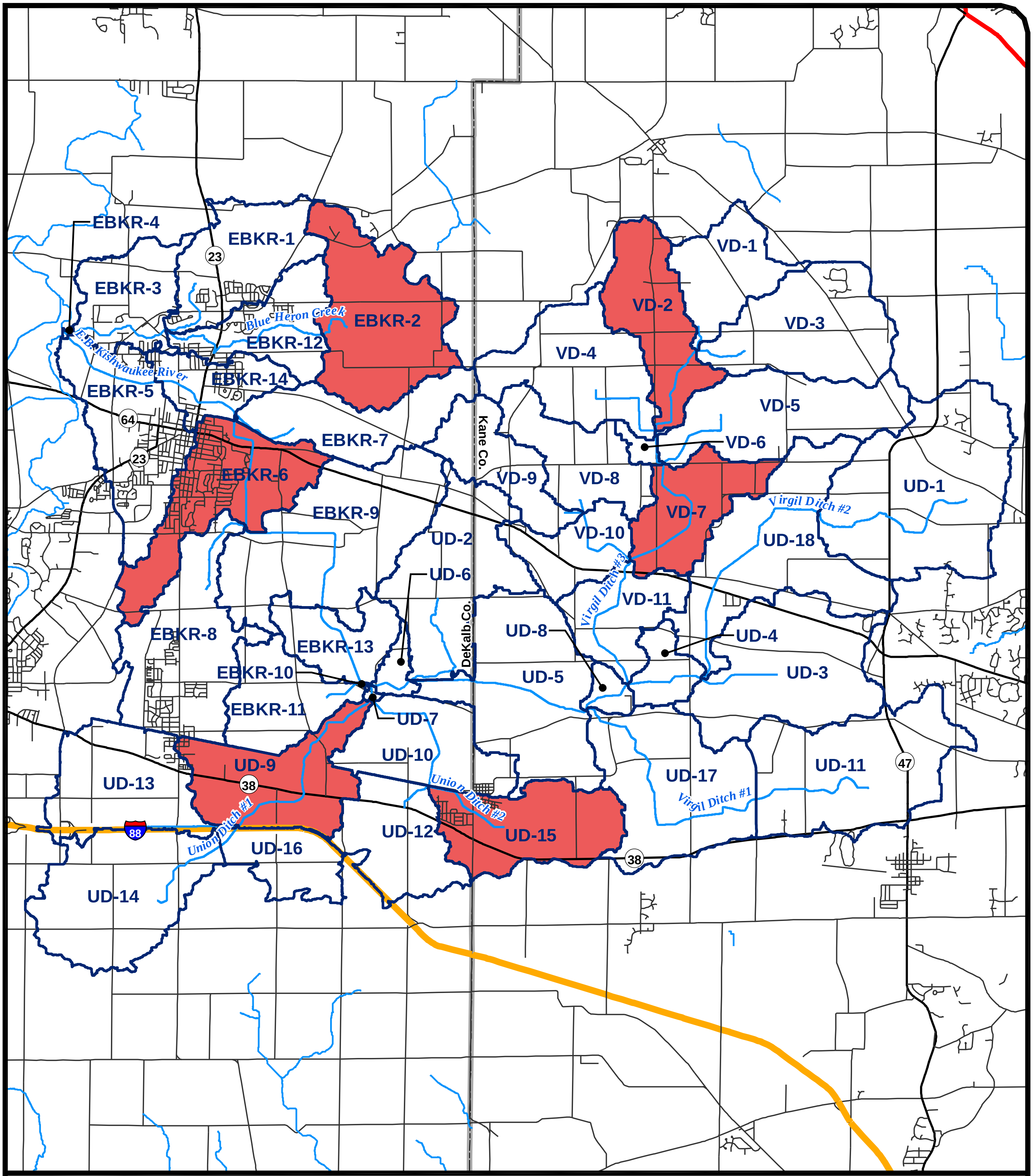
0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch
Watershed
Improvement Plan

3-32 - Problem Areas



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Legend

- 🟥 Critical SMUs
- ▭ Stormwater Management Units
- — Rivers & Streams
- — Interstate/Tollway
- — U.S. Highway
- — State Highway
- — Streets
- ▭ County Boundary

0 0.75 1.5
Miles

N
W E
S

1 inch = 10,500 feet

Union-Virgil Ditch Watershed Improvement Plan

3-33 - Critical Stormwater Management Units

Chapter 4.0 Watershed Best Management Practice (BMP) and Solutions Toolbox

This section presents a brief illustrated overview of a variety of site planning and stormwater and landscaping best management practices (BMPs). The BMPs are integrated into the East Branch South Branch Kishwaukee River Watershed-Based Plan action items and recommendations presented in Chapter 5. Following the brief descriptions, more detailed information including guidance on applicable scale and land use, benefits and effectiveness, and design considerations are included on BMP Fact Sheets.

4.1 Planning Process BMPs

Planning process BMPs are policy goals used to maintain high environmental quality as a watershed develops and/or restore environmental quality during redevelopment. Significant natural features can be created and/or preserved by open space requirements and other standards. Open space preservation/restoration and riparian buffer standards are tools used to preserve natural resources during development and/or restore natural resources during redevelopment. Impervious area reduction is a critical site-level planning and design strategy used to achieve stormwater management and water quality goals.

Flow Path Analysis: A flow path analysis involves the development of an idealized representation of how water would flow assuming that all the sewers are full and all lakes, depressional areas and other low-lying areas are full of water. This tool is useful for identifying areas where green infrastructure and other storage BMPs could be placed in order to reduce the potential for flooding.

Impervious Area Reduction: Impervious area reduction can be achieved in a variety of ways including adding rain garden "bump outs" to neighborhood streets, increasing pervious areas in large parking lots by installing depressed parking lot islands and use of permeable pavement.

Open Space: Protection or re-establishment of open space and/or natural areas as greenways, in order to preserve and connect significant water quality and habitat features and improve aesthetic, recreational and/or alternative transportation uses.

Riparian Buffer: A riparian buffer is a vegetated area next to a stream or wetland that protects water resources from pollution, stabilizes the stream bank, and offers aquatic and wildlife habitat.

4.2 Stormwater BMPs

Stormwater BMPs are site-specific practice, techniques, methods, or structural controls that are designed to manage the quantity and improve the quality of stormwater runoff in a cost-effective manner. Commonly, stormwater BMPs minimize onsite and offsite hydrologic and water quality impacts from stormwater runoff by incorporating and re-establishing natural hydrologic processes into an urbanized area. Stormwater BMPs can be both integrated into new development or retrofitted into existing developments.

Bioswales: Bioswales are filtration and infiltration systems planted with grasses, shrubs, and wetland plants designed to filter, retain, evapotranspirate, and infiltrate stormwater. Typically, bioswales are constructed with an underdrain and infiltration trench comprised of engineered soil and gravel. The infiltration trench provides additional stormwater storage and facilitates infiltration of water into the surrounding soils and groundwater.

Permeable Pavement: Permeable pavement is pavement that is designed to allow for the infiltration of rain and snowfall. Permeable pavement is constructed with an underdrain and infiltration trench bed comprised of gravel underneath the permeable pavement. Rain that falls on the permeable pavement infiltrates into the gravel and then into the soil and/or groundwater below. Runoff that is not infiltrated is slowly released from the trench into a second BMP as part of a stormwater BMP "treatment train" or into the storm sewer system.

Rain Gardens: Rain gardens are landscaped gardens designed to filter, retain, evapotranspirate, and infiltrate stormwater from roofs, driveways, or lots.

Vegetated Swales: Vegetated swales are stormwater features that convey, retain, and infiltrate stormwater. Water quality benefits of vegetated swales are enhanced by the planting of native vegetation in the swale.

Bioinfiltration Basins: Bioinfiltration basins are used to temporarily store stormwater runoff and release it at a rate designed to protect stream health and provide water quality treatment. Bioinfiltration basins are planted with native wetland and prairie vegetation to provide additional water quality benefits and provide habitat for aquatic and terrestrial species. The bioinfiltration basins can be designed both as shallow wetland systems with little to no open water or as open water wetland ponds with a wetland fringe and prairie sideslopes.

Rain Barrels/Cisterns: Rain barrels and cisterns are storage vessels uses to capture and temporarily store rainfall for landscape irrigation.

4.3 Landscaping BMPs

Landscaping has many properties that make it an important BMP to integrate into watershed planning action plans. Landscaping improves biodiversity, aesthetics, and habitat and cools ambient air. Native landscaping can also improve water quality through increasing infiltration and filtration of stormwater runoff.

Stormwater Trees: Trees can reduce stormwater runoff from impervious areas such as parking lots, roads, and buildings. Trees have an effect on stormwater above the ground surface, at the ground surface, and below the ground surface by slowing, storing, and infiltrating runoff.

Native Landscaping: Native vegetation uses the plants that were endemic to a specific geographical region prior to settlement for a variety of purposes including habitat improvement and increasing stormwater infiltration and water quality treatment.

Soil Amendments: A soil amendment is any material added to a soil to improve its physical properties, such as water retention, permeability, water infiltration, drainage, aeration and structure.

Stream/Wetland Management and Restoration: Landscape restoration practices designed to maintain existing remnant landscapes and/or restore streams and wetlands to their natural state.

Streambank Stabilization: Streambank stabilization includes the use of bioengineering techniques to address streambank erosion and protect private property, roadways, and utilities from damage caused by streambank erosion.

4.4 Flood Reduction BMPs

Non-Structural Flood Control: Non-structural flood control measures include floodproofing, acquisition and demolition of flood damaged buildings, and elevating or relocating buildings out of the floodplain.

Structural Flood Control: Structural flood control measures include reservoirs, levees, floodwalls, diversions, stream channel conveyance improvements, and stormsewer improvements. These measures are generally designed to reduce the risk of flood damage in urbanized areas. Structural flood control projects are frequently cost prohibitive for munipalities to implement without some type of financial assistance through cost sharing or grants.

The following Fact Sheets include guidance on applicable scale and land use, benefits and effectiveness, and design considerations of stormwater BMPs and solutions that are recommended as Action Items in Chapter 5 of this watershed-based plan. The general layout of the Fact Sheets is described below.

BMP Description: Provides a description of the BMP, how it works, and water quality and stormwater management benefits provided by the BMPs.

Applicability: Where and how each BMP is applicable addressed by scale, application, and effectiveness:

Scale

- **Watershed/County:** Applied at a regional scale in the watershed or county-wide.
- **Town/Village:** Applied at a municipal level.
- **Neighborhood:** Applies at development or other sub-municipal level.
- **Lot:** Applied on individual residential, commercial, or industrial lots.

Application

- **Retrofit:** Applied to existing development, infill, and redevelopment.
- **New:** Applied to new development.
- **Roofs:** Applied on roofs or to treat roof runoff.
- **Streets:** Applied on or used to treat runoff from streets and roads.
- **Driveways:** Applied on or used to treat runoff from driveways.
- **Parking Lots:** Applied on or used to treat runoff from parking lots.
- **Lawns:** Applied on or used to treat runoff from lawns that are planted with turf grass.
- **Sensitive Areas:** Applied to ecologically important areas such as floodplains, wetlands, and highly erodible soils.

Effectiveness

- **Runoff Rate Control:** BMPs that control or reduce runoff rates.
- **Runoff Volume Control:** BMPs that control or reduce runoff volumes.

- **Physical Habitat Preservation/Creation:** BMPs that preserve, restore, or provide wildlife habitat.
- **Sediment Pollution Control:** BMPs that reduce the amount of suspended sediment in runoff.
- **Nutrient Control:** BMPs that reduce the amount of nutrients in runoff.
- **BOD Control:** BMPs that remove constituents that cause BOD in runoff.
- **Other Pollutant Control:** BMPs that reduce the amount of metals, petroleum-based compounds, and other pollutants in runoff.

Design Consideration: Design recommendation that should be considered when designing and implementing the BMP.

Additional Benefits: Other positive effects that the BMP provides beyond its stormwater and water quality benefits.

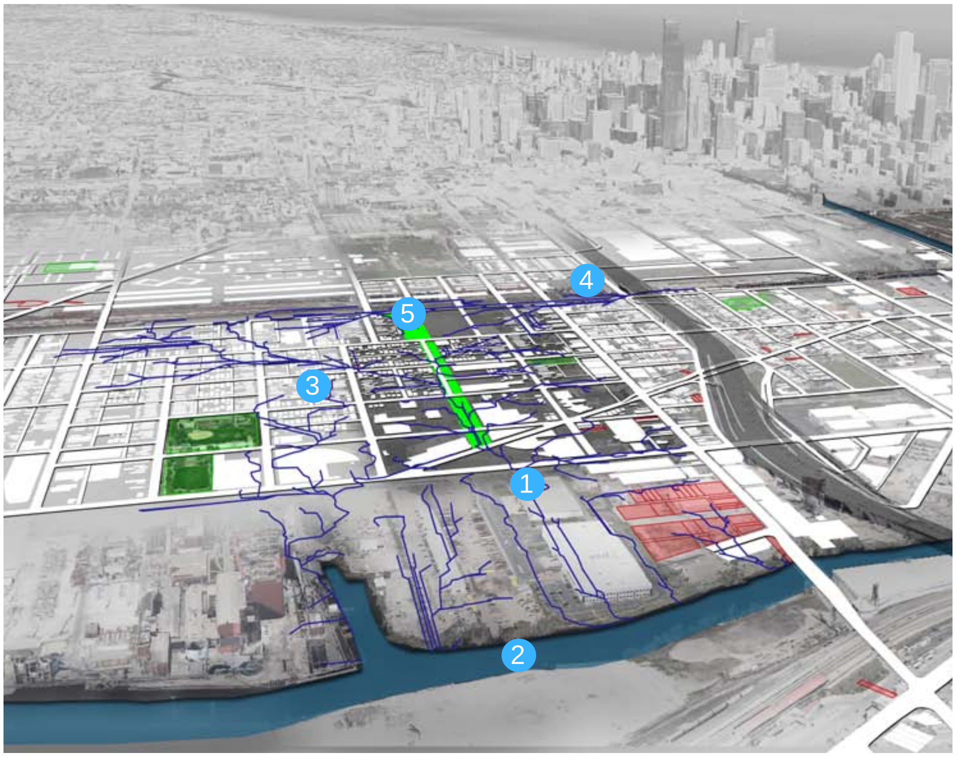
Maintenance: Recommendation on maintenance practices necessary to keep the BMP functioning as designed.

FLOWPATH ANALYSIS

PLANNING PROCESS BMP

Stormwater Flowpath Analysis is used to identify primary infiltration opportunities based on LiDAR topographic data and other key elements.

Stormwater Runoff (Flowpath) ①
Point of Collection (River) ②
Impervious Drainage Area ③
Surface Flow Obstruction (Metra) ④
Infiltration Opportunities ⑤



SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☐ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☐ Driveways
☐ Lawns
☐ New
☒ Remedial
☒ Streets
☐ Roofs
☐ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
● Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◐ Moderate
○ Low

DESCRIPTION

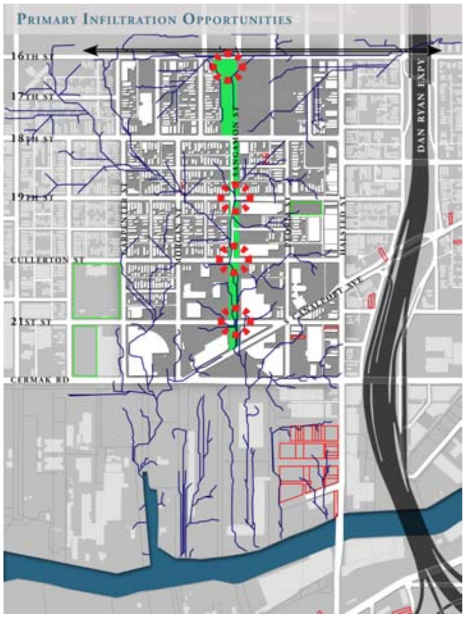
Stormwater flowpath analysis identifies key features such as significant outfalls, inlets to large diameter pipes and obstructions such as buildings, rail lines, and roads while incorporating LiDar topographic data in order to model stormwater surface runoff.

Flowpath analysis is most useful on a large scale to help identify surface flow patterns and major collection points. The patterns observed can be used as a watershed planning tool to help prioritize primary opportunities to infiltrate stormwater runoff before entering the sewer system, streams, rivers, and lakes.

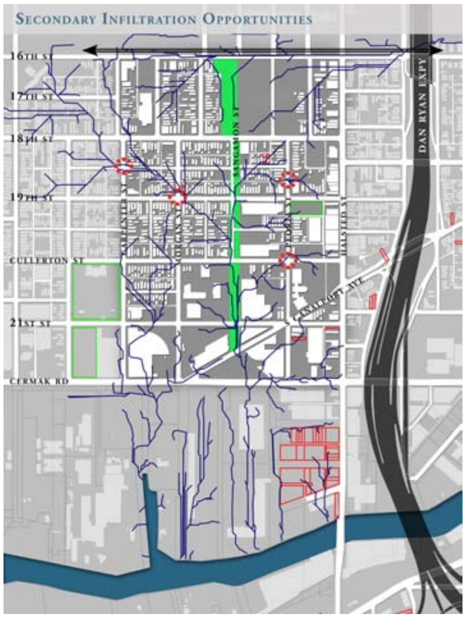
The hydrologic modeling tools in the ArcGIS Spatial Analyst extension toolbox provide methods for describing the physical components of a surface. The hydrologic tools allow you to identify sinks, determine flow direction, calculate flow accumulation, delineate watersheds, and create stream networks. The image above is of a resulting network derived from an elevation model.

This data is compiled into a GIS data base that is used to develop a comprehensive understanding of the surrounding land use. This process is used to indicate ideal areas to incorporate stormwater BMP’s that will function as an overall system and aid in the planning process to establish interconnected greenways that connect open space, sensitive habitats, and recreational uses in a sustainable and responsible manner.

FLOW PATH ANALYSIS
PLANNING PROCESS BMP



Primary Infiltration Opportunities



Secondary Infiltration Opportunities

ADDITIONAL BENEFITS

- Allows for public input / awareness by providing comprehensive analysis exhibits.
- An excellent resource for understanding basic hydrology on a site specific scale.
- Helps to identify and prioritize areas that would be most beneficial for stormwater infiltration
- Flowpath analysis is best utilized when added to other GIS layers such as lots, rights-of way, streets, structures, stream, rivers, wetlands etc. to gain a comprehensive understanding of the watershed.

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FLOWPATH ANALYSIS

PLANNING PROCESS BMP

Stormwater Flowpath Analysis is used to identify primary infiltration opportunities based on LiDAR topographic data and other key elements.

Stormwater Runoff (Flowpath) ①

Point of Collection (Bioswale) ②

Impervious Drainage Area ③

Surface Flow Obstructions (Roads) ④

Combined Sewer Overflow Area ⑤

SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☐ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☐ Driveways
☐ Lawns
☐ New
☒ Remedial
☒ Streets
☐ Roofs
☐ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
● Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◐ Moderate
○ Low

DESCRIPTION

Stormwater flowpath analysis identifies key features such as significant outfalls, inlets to large diameter pipes and obstructions such as buildings, rail lines, and roads while incorporating LiDar topographic data in order to model stormwater surface runoff.

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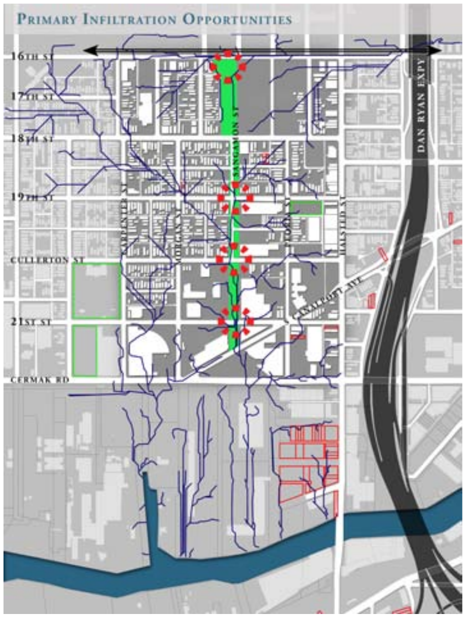
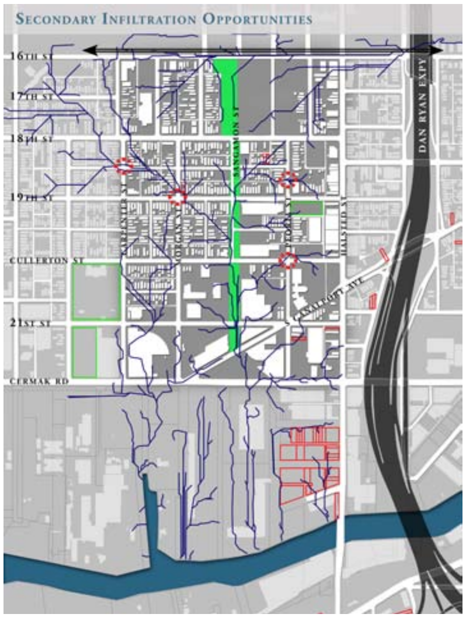
FLOW PATH ANALYSIS

PLANNING PROCESS BMP



Primary Infiltration Opportunities



Secondary Infiltration Opportunities

ADDITIONAL BENEFITS

- Allows for public input / awareness by providing comprehensive analysis exhibits.
- An excellent resource for understanding basic hydrology on a site specific scale.
- Helps to identify and prioritize areas that would be most beneficial for stormwater infiltration
- Flowpath analysis is best utilized when added to other GIS layers such as lots, rights-of way, streets, structures, stream, rivers, wetlands etc. to gain a comprehensive understanding of the watershed.

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IMPERVIOUS AREA REDUCTION

PLANNING PROCESS BMP

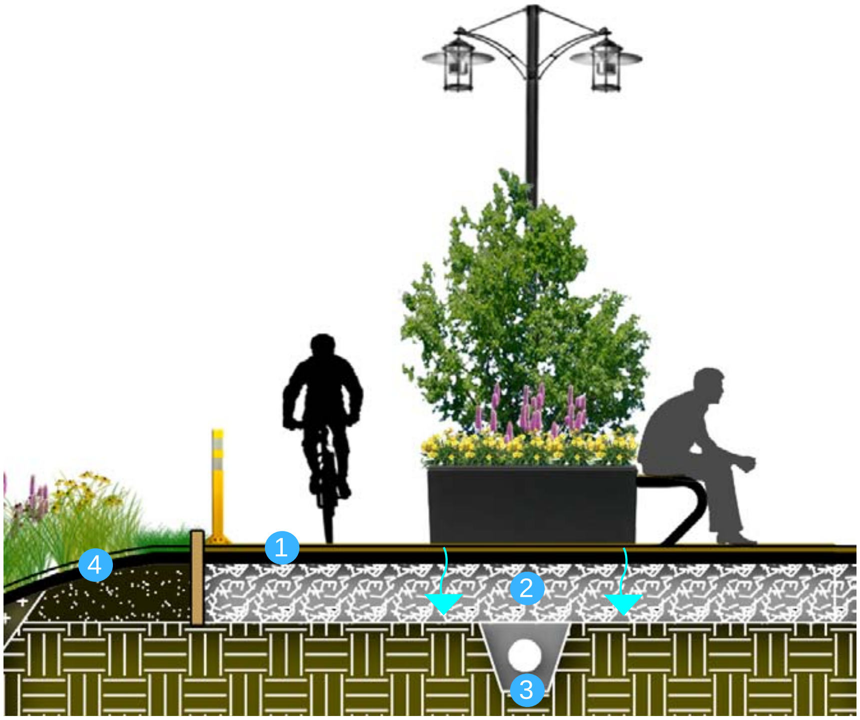
Site-level planning and design strategy used to achieve stormwater management and water quality goals by incorporating BMP's into new development or as a retrofit to existing impervious design.

Permeable Pavement ①

Sub-base Gravel Storage ②

Underdrain (if necessary) ③

Overflow to Stormwater BMP ④



SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☒ Driveways
☐ Lawns
☒ New
☒ Remedial
☒ Streets
☐ Roofs
☐ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
○ Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◐ Moderate
○ Low

DESCRIPTION

Impervious area reduction can be achieved in a variety of ways including adding rain garden 'bump outs' to retrofitting neighborhood streets, increasing pervious areas in large parking lots by installing depressed parking lot islands and use of permeable pavement.

Permeable pavements refer to paving materials that promote the absorption of rainfall and snowmelt. There are four main types of permeable pavements: porous concrete, porous asphalt, permeable grid pavers, and permeable pavers. See detailed descriptions of each paving system below.

Porous Concrete: Porous concrete looks very similar to regular concrete. Porous concrete typically consists of specialty formulated mixtures of Portland cement, course aggregate and water that has been manufactured to have gaps through which water can flow into an infiltration bed of uniformly graded gravel.

Porous Asphalt: Porous asphalt looks very similar to regular asphalt. Porous asphalt consists of course aggregate bonded together by asphalt cement with sufficient gaps through which water can flow into an infiltration bed of uniformly graded gravel.

Permeable Grid Pavers: Permeable grid pavers are modular plastic pavers that fit together with funnel-like openings installed over an infiltration bed of gravel. Depending on the site, grass or rock is used to fill in the funnel-like openings. Using plastic for the grids makes them very flexible and they can be used on uneven surfaces.

Permeable Pavers: Permeable pavers are modular concrete pavers that fit together with funnel-like openings installed over an infiltration bed of uniformly graded gravel. Depending on the site, grass or rock is used to fill in the funnel-like openings.

IMPERVIOUS AREA REDUCTION

PLANNING PROCESS BMP

Permeable Paver Circulation Node

Permeable Paver Parking Lot with Depressed Islands

Rain Garden Bumpout Under Construction

ADDITIONAL BENEFITS

Impervious area reduction such as permeable pavement removes suspended solids through filtration. Dissolved pollutants such as nutrients and metals are removed and/or transformed as runoff infiltrates into the soil. Utilizing the Illinois EPA's Estimating Pollutant Load Reductions for Nonpoint Source Pollution Control BMPs worksheets, the permeable pavement can remove approximately 75% of the total phosphorous, 90% of total suspended solids, and 100% of lead and zinc.

Impervious Area Reduction provides more than just stormwater management.

- Reduces urban heat island effect and thermal impacts to waterbodies.
- Reduces development and maintenance costs.
- Provides paving options for site specific applications.
- Increases green space for habitat and recreational uses.
- Provides opportunities for greenways and open space linkages

DESIGN CONSIDERATIONS

- Site conditions such as adjacent land uses, soil type, and slopes should be assessed to determine if / which BMP solutions are appropriate to reduce impervious areas.
- The drainage area or local watershed will need to be determined in order to design for appropriate storage requirements.
- Policy goals should be established to maintain a high environmental quality standard as a watershed is developed.

OPERATIONS AND MAINTENANCE

All impervious area reduction measures taken need to be maintained and will vary depending on the BMP method designed, which is described in detail on the accompanying fact sheets.

DEKALB COUNTY
COMMUNITY
FOUNDATION

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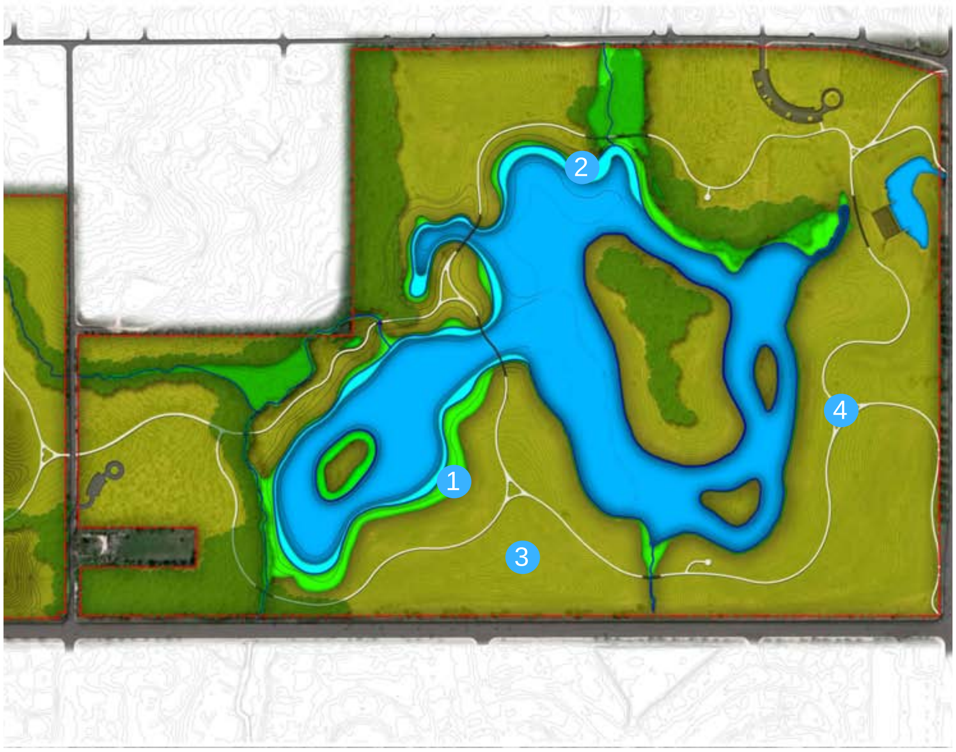
OPEN SPACE
PLANNING PROCESS BMP

Establishment of open space and natural areas that provide for greenways in order to preserve and connect significant water quality and habitat features, while accommodating recreational uses.

Restored Wetland ①
Restored Emergent Zone ②
Restored Upland ③
Recreational Trail ④



SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☐ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☒ Driveways
☐ Lawns
☒ New
☒ Remedial
☐ Streets
☐ Roofs
☒ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
● Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Open space is an essential planning tool used to preserve natural resources during development activities. The purpose of open space is to protect or re-establish natural areas as greenways that preserve and connect significant water quality and habitat features, while improving aesthetic, recreational and / or alternative transportation uses.

Planning for open space requires coordination between numerous community agencies to develop an integrated plan for open space protection and development. An open space plan should look at all public open space, regardless of ownership, including non-traditional open spaces such as vacant lots, community gardens, cemeteries, greenways, trails, and thoroughfares, as well as the traditional parks, playgrounds, squares, and malls. It should also examine open lands under private ownership, such as non-profit institutions, so as to understand their role in the overall open space system.

Open space planning should investigate the communities population to understand demographic and socio-economic trends of the residents and open space users. A plan should identify play space opportunities for newly emerging sports and other recreational activities. Public input on existing open space successes as well as failures is valuable knowledge during the planning process.

OPEN SPACE
PLANNING PROCESS BMP


Open Space Adjacent to Wetlands and Recreational Trails


Open Space Incorporating Recreational Water Front Activities


Open Space Re-Establishment

ADDITIONAL BENEFITS

- Provides greenspace for local residents to enjoy.
- Provides open space to effectively plan for and treat stormwater runoff.
- Improves enhanced aesthetics as well as social, cultural, and environmental resources for the local community.

DESIGN CONSIDERATIONS

- Open space planning should involve public input whenever possible to encourage involvement in the process, which will lead to a sense of ownership and pride in the community.
- Open space should focus on providing enhanced environmental functions as well as recreational uses.
- Existing conditions such as land uses, soil type, and slopes should be assessed to determine open space requirements as well as uses.

OPERATIONS AND MAINTENANCE

The operations and maintenance requirements for any open space will require ongoing efforts not only for maintenance, but also programming in order to continually enhance the functionality of the intended purpose. This will require coordination efforts between numerous community groups, agencies, and departments to help manage and maintain open space lands.

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RIPARIAN BUFFER

PLANNING PROCESS BMP

Vegetated area next to a stream or wetland that protects water resources from pollution / sediment, bank failure, and provides aquatic and wildlife habitat.

Lowland Buffer Zone ①
Upland Buffer Zone ②
Woodland Buffer Zone ③
Stream / River ④
Recreational Opportunities ⑤

SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☐ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☐ Driveways
☐ Lawns
☒ New
☒ Remedial
☐ Streets
☐ Roofs
☒ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
● Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

A riparian buffer is a vegetated area next to a stream or wetland that protects water resources from pollution, stabilizes the stream bank, and provides aquatic and wildlife habitat.

Properly designed riparian buffers protect stream water quality by naturally intercepting and filtering pollution from runoff. Streams that are protected by well-established riparian buffers tend to be more resistant to negative impacts from erosion, flooding, and pollution from nutrients, sediment, organic matter, pesticides and other harmful substances.

Riparian buffers can also improve the health of animals and fish that live in or near the stream by providing food, shelter and clean water. Riparian buffers are not public access ways to private property

In developed areas, even narrow bands of vegetation can make significant improvements in water quality, habitat, and the environmental health of a stream. Urban buffers are especially effective when coupled with pollution and flooding control technologies. Additionally riparian buffers bring a natural character to developed settings, improving the quality of life and scenic nature in an urban setting.

RIPARIAN BUFFER
PLANNING PROCESS BMP

Agricultural Riparian Buffer

Agricultural Drainage Without a Riparian Buffer

Riparian Buffer in a Park Setting

ADDITIONAL BENEFITS

Riparian buffers provide more than just stormwater management.

- Enhances the aesthetics of the local landscape
- Provides habitat for wildlife
- Buffers reduce stream bank erosion, which helps keep valuable acreage from washing away.

DESIGN CONSIDERATIONS

- Riparian buffer width should be dependent on stream or wetland quality, ground slope, and quality of feature.
- Buffer should be planted with native riparian vegetation.
- Buffers are often established and protected through municipal ordinances.

OPERATIONS AND MAINTENANCE

The maintenance requirements for riparian buffers are minimal. The buffers just need to be inspected periodically to remove litter and invasive species. Sparse areas may also need to reseeded or replanted as necessary.

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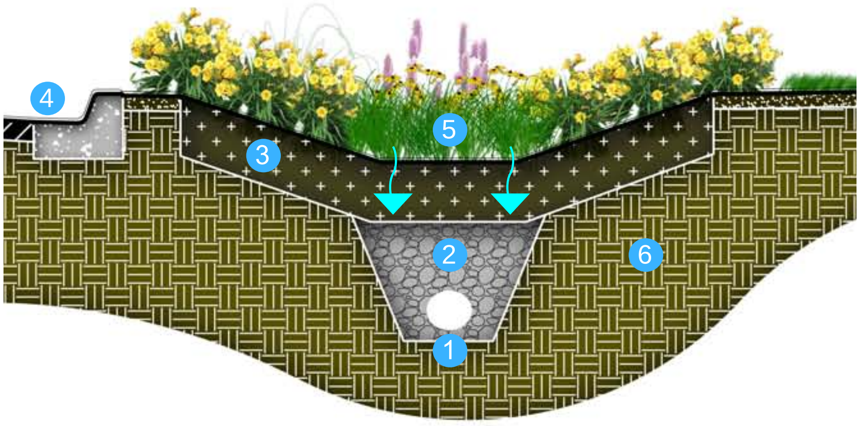
BIOSWALE
STORMWATER BMP

Filtration and infiltration systems planted with grass, shrubs, and wetland plants designed to filter, retain, evapotranspirate, and infiltrate stormwater.

Perforated Underdrain set in gravel ①
Infiltration Trench ②
Engineered Soil ③
Impervious Drainage Area ④
Wet and Dry Tolerant Vegetation ⑤
Native Soils ⑥



SCALE

☐ Watershed / County
☐ Town / Village
☒ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☒ Driveways
☐ Lawns
☒ New
☒ Remedial
☒ Streets
☐ Roofs
☐ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
○ Habitat Preservation / Restoration
● Sediment Control
◒ Nutrient Control
◒ BOD / COD Control
◒ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Bioswales are stormwater treatment systems that provide an alternative to traditional curb-and-gutter and storm sewers. Bioswales are broad, vegetated channels that reduce the rate and volume of runoff from a site. They are commonly planted with wet-tolerant species and will remain wet for a few days following a storm.

Bioswales differ from traditional vegetated swales in that the bioswales are primarily used for storage of stormwater while a vegetated swale is utilized for conveying water. In order to increase the storage capacity of the bioswale, the bioswale can be constructed with an underdrain and infiltration trench comprised of engineered soil and gravel, while a traditional vegetated swale is constructed on native soils. The infiltration trench provides additional stormwater storage and facilitates infiltration of water into the surrounding soils and groundwater. Once the storage capacity of the infiltration trench has been reached, the underdrain will convey the water into the storm sewer system.

The bioswales remove suspended solids through settling and filtration. Dissolved pollutants such as nutrients and metals are removed and/or transformed as runoff infiltrates into the soil. Based on published pollutant removal efficiencies, bioswales can remove approximately 100% of the total phosphorous, 94% of total suspended solids, and 83% of biochemical oxygen demand (the degree of organic pollution in water leading to the depletion of oxygen).

BIOSWALE
STORMWATER BMP


Bioswale adjacent to a Parking Lot


Terraced Bioswale


Bioswale Under Construction

ADDITIONAL BENEFITS

Bioswales provide more than just stormwater management.

- Enhances the aesthetics of the local landscape.
- Provides habitat for wildlife.
- Can be used for snow storage during winter months.

DESIGN CONSIDERATIONS

- Bioswales must be sized and designed to account for drainage area and soils.
- Infiltration storage should be designed to drain in 24-72 hours.
- Filtration benefits can be improved by planting native deep-rooted vegetation.
- Salt tolerant species should be used if the swale is to receive runoff from parking lots and roads.
- Topsoil should be amended with compost and/or sand as a means of improving organic content for enhanced filtering and to achieve adequate infiltration.

OPERATIONS AND MAINTENANCE

The maintenance requirements for bioswales are minimal. The bioswales should be inspected periodically to remove litter and blockages. Sparse areas may need to be reseeded or replanted.

DEKALB COUNTY
COMMUNITY
FOUNDATION

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PERMEABLE PAVEMENT
STORMWATER BMP

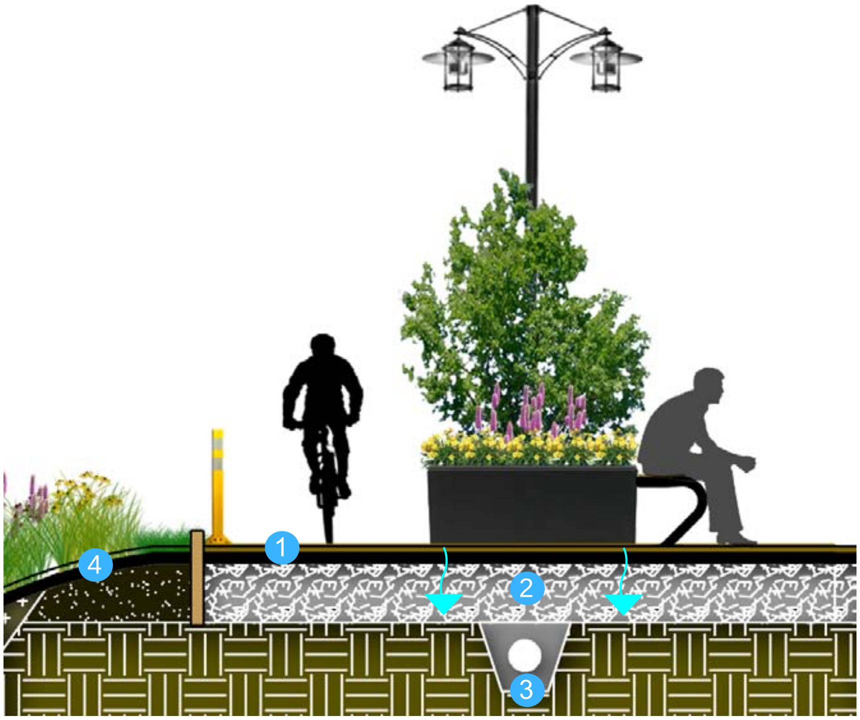
Paving materials designed to allow for the infiltration of rain and snowmelt consisting of highly porous paving surfaces as well as sub-base storage layers.

Permeable Pavement ①

Sub-base Gravel Storage ②

Underdrain (if necessary) ③

Overflow to Stormwater BMP ④



SCALE

☐ Watershed / County
☐ Town / Village
☒ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☒ Driveways
☐ Lawns
☒ New
☒ Remedial
☒ Streets
☐ Roofs
☐ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
○ Habitat Preservation / Restoration
● Sediment Control
◒ Nutrient Control
◒ BOD / COD Control
◒ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Permeable pavements refer to paving materials that promote the absorption of rainfall and snowmelt. There are four main types of permeable pavements: porous concrete, porous asphalt, permeable grid pavers, and permeable pavers. See detailed descriptions of each paving system below.

Porous Concrete: Porous concrete looks very similar to regular concrete. Porous concrete typically consists of specialty formulated mixtures of Portland cement, course aggregate and water that has been manufactured to have gaps through which water can flow into an infiltration bed of uniformly graded gravel.

Porous Asphalt: Porous asphalt looks very similar to regular asphalt. Porous asphalt consists of course aggregate bonded together by asphalt cement with sufficient gaps through which water can flow into an infiltration bed of uniformly graded gravel.

Permeable Grid Pavers: Permeable grid pavers are modular plastic pavers that fit together with funnel-like openings installed over an infiltration bed of gravel. Depending on the site, grass or rock is used to fill in the funnel-like openings. Using plastic for the grids makes them very flexible and they can be used on uneven surfaces.

Permeable Pavers: Permeable pavers are modular concrete pavers that fit together with funnel-like openings installed over an infiltration bed of uniformly graded gravel. Depending on the site, grass or rock is used to fill in the funnel-like openings.

By infiltrating the majority of the stormwater that falls onto the permeable pavement, the amount of water and pollution flowing into storm sewers or directly into streams is greatly reduced.

PERMEABLE PAVEMENT
STORMWATER BMP

Permeable Paver Circulation Node

Permeable Paver Parking Lot

Porous Asphalt

ADDITIONAL BENEFITS

Permeable pavement removes suspended solids through filtration. Dissolved pollutants such as nutrients and metals are removed and/or transformed as runoff infiltrates into the soil. Utilizing the Illinois EPA's Estimating Pollutant Load Reductions for Nonpoint Source Pollution Control BMPs worksheets, the permeable pavement can remove approximately 75% of the total phosphorous, 90% of total suspended solids, and 100% of lead and zinc.

Permeable pavement provides more than just stormwater management.

- Permeable pavements can be engineered to be just as stable as conventional methods and provide the same functionality of traditional concrete and asphalt.
- Reduces urban heat island effect and thermal impacts to waterbodies.
- Reduces development and maintenance costs.
- Provides paving options for site specific applications.

DESIGN CONSIDERATIONS

- Site conditions such as adjacent land uses, soil type, and slopes should be assessed to determine if a permeable paving solution is appropriate.
- A pretreatment system of surface runoff is beneficial to maintain the functionality of the permeable paving system to avoid large sediment loads.
- In large storm events the surface flow will exceed storage capacity of the permeable system. Thus, a series of overflow systems will need to accommodate the influx of surface runoff such as rain gardens, bioswales or other applicable BMP's.
- The drainage area or local watershed will need to be determined in order to design for appropriate storage requirements.

OPERATIONS AND MAINTENANCE

Permeable pavements should be inspected annually and after large storm events to assure the pavements are still fully functioning. Permeable pavements should be maintained with vacuum-type street sweeping equipment periodically to remove any accumulated sediment and leaves. Polymeric jointing sand, commonly used with traditional pavers, should never be used with permeable pavers as it will prevent infiltration.

DEKALB COUNTY COMMUNITY FOUNDATION

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RAIN GARDEN
STORMWATER BMP

Landscaped gardens designed to filter, retain, evapotranspirate, and infiltrate stormwater from roofs, driveways, streets, or lots.

Surface Area Runoff to BMP ①
Engineered Soil ②
Underdrain (if necessary) ③
Overflow to Storm Sewer or BMP ④
Stormwater Input ⑤
Wet and Dry Tolerant Vegetation ⑥

SCALE

☐ Watershed / County
☐ Town / Village
☒ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☒ Driveways
☒ Lawns
☒ New
☒ Remedial
☒ Streets
☒ Roofs
☒ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
◒ Habitat Preservation / Restoration
● Sediment Control
◒ Nutrient Control
◒ BOD / COD Control
◒ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Rain gardens are one of the many BMPs that can be implemented at home to reduce the impacts of stormwater in your watershed. Building a rain garden is one of the most simple and cost effective solutions to protect water quality on a local scale. The purpose of a rain garden is to store and promote the infiltration of rainfall into the groundwater. Without rain gardens, the majority of the rain that falls onto impervious surfaces around your home such as driveways, sidewalks, streets, alleys, and roofs will flow directly into the sewer system or nearby lakes and streams.

When properly constructed a rain garden will reduce the amount of runoff from your property. In addition, the plants in the rain garden will also reduce the amount of pollutants in stormwater runoff. Suspended sediments and attached pollutants such as phosphorus and metals are settled out of the stormwater and captured in the depression. Dissolved pollutants such as nitrogen and organic matter are filtered out and/or transformed by the vegetation as the runoff infiltrates into the underlying soils.

General guidelines and recommendations are listed below:

Recommended Plant Species:

- Black-eyed Susan
- Butterfly Weed
- Golden Alexander
- Obedient Plant
- Purple Coneflower
- Spiderwort
- Wild Columbine
- Wild Geranium

Considerations:

- Make sure to have utilities marked before digging.
- Avoid building a rain garden over or near septic fields or building foundations
- Plants should be tolerant to both wet and dry conditions.
- Use of fertilizer and pesticides is typically unnecessary.

RAIN GARDEN
STORMWATER BMP


Urban Streetscape Rain Garden


Curb-Side Rain Garden


Parking Lot Rain Garden

ADDITIONAL BENEFITS

Rain gardens are essentially bioretention systems that provide numerous benefits to a local watershed.

- Wide range of scales and applicability.
- Filters silt, pollutants and debris.
- Reduces peak-flow rates of stormwater from entering the sewer system and can help reduce the occurrences of combined sewer backups.
- Recharges groundwater.
- Provides habitat for birds and other wildlife.
- Provides an aesthetic amenity while performing essential stormwater management.

DESIGN CONSIDERATIONS

- Site conditions such as adjacent land uses, soil type, and slopes should be assessed to determine if a rain garden is an appropriate solution.
- Locate rain gardens a minimum of 10 feet from building foundations.
- Determine area of runoff that is directed to the rain garden and make sure it will not affect adjacent properties or land uses.
- Conduct an infiltration test to determine the rate at which water will permeate the soils. A rain garden should be fully drained within 24 hours after a storm event. This will help to determine the size and depth required.
- Rain gardens vary greatly in cost depending on size, shape, depth, plant material and setting (urban vs. residential).

OPERATIONS AND MAINTENANCE

Just like any garden, your rain garden needs to be properly maintained in order for it to function properly. After your garden is first built, the plants will need to be watered through the first growing season. After the first season you will only need to water the rain garden during drought conditions. Any debris that may alter the drainage or overflow during large storm events need to be addressed so flooding does not occur.

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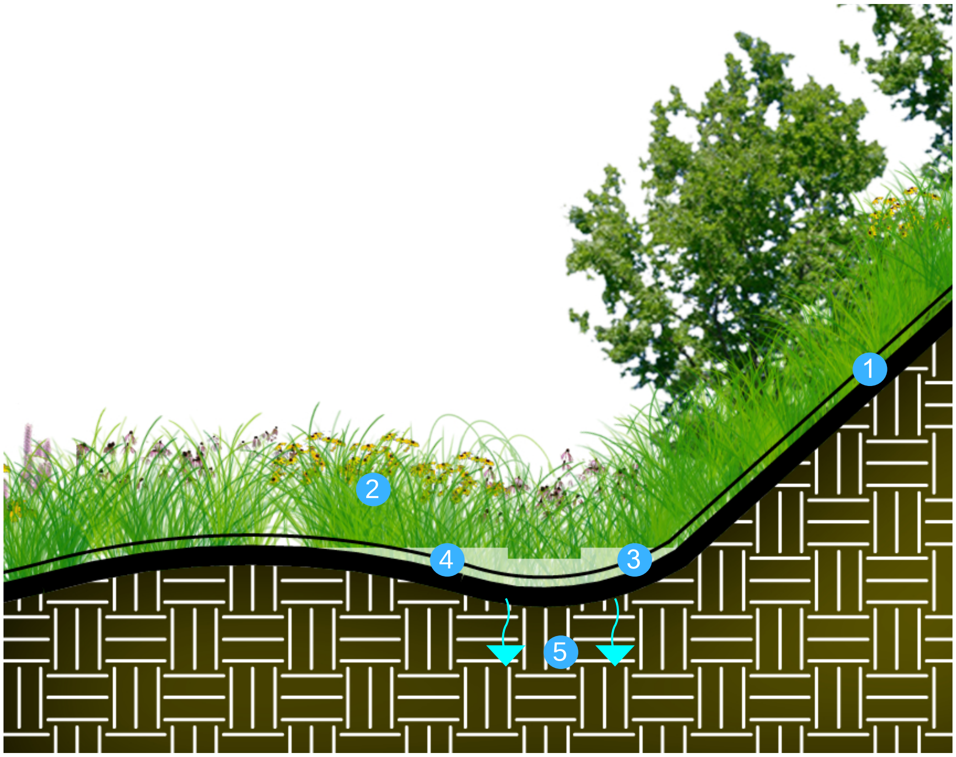
VEGETATED SWALE

STORMWATER BMP

Common stormwater treatment system used to convey and treat stormwater runoff often planted with native vegetation.

Stormwater Runoff to BMP ①
Native Vegetation ②
Check Dams (slopes over 5%) ③
3:1 Maximum Channel Slope ④
Native Soils ⑤



SCALE

☐ Watershed / County
☐ Town / Village
☒ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☒ Driveways
☒ Lawns
☒ New
☒ Remedial
☒ Streets
☒ Roofs
☐ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
◒ Runoff Volume Control
◒ Habitat Preservation / Restoration
● Sediment Control
◒ Nutrient Control
◒ BOD / COD Control
◒ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

A vegetated swale is a common stormwater treatment system that is used to convey and treat stormwater runoff by acting as a buffer between impervious areas such as roads, parking lots, and driveways or areas where stormwater runoff may exponentially accumulate. While a roadside ditch is technically a vegetated swale, these are typically referred to as ‘grassed swales’. The term vegetated swale most typically refers to swales that are densely vegetated. Vegetated swales function best when constructed with gentle slopes to minimize flow velocities and maximize opportunities for the absorption of runoff and filtering of pollutants.

Vegetated swales will improve the water quality of stormwater by slowing runoff speed, trapping sediment and other pollutants, and providing some absorption. Choosing to plant swales with native vegetation is more effective in managing runoff than if it was planted with short turf grass.

Vegetated swales removes suspended solids through settling and filtration. Dissolved pollutants such as nutrients and metals are removed and/or transformed as runoff infiltrates into the soil. Based on published pollutant removal efficiencies, vegetated swales can remove approximately 20% of the total phosphorous, 65% of total suspended solids, and 50-71% of metals.

VEGETATED SWALE
STORMWATER BMP

Vegetated Swale in Open Space

Terraced Vegetated Swale

Terraced Vegetated Swale

ADDITIONAL BENEFITS

Vegetated Swales provide more than just stormwater management.

- Enhances the aesthetics of the local landscape.
- Provides habitat for wildlife.
- Can be used for snow storage during winter months.
- Low maintenance requirements.

DESIGN CONSIDERATIONS

- Vegetated swales must be sized to convey design runoff rate.
- Filtration benefits can be improved by planting native deep-rooted vegetation.
- Salt tolerant species should be used if adjacent to a road or parking lot.
- Topsoil should be amended with compost and/or sand as a means of improving organic content for filtering and to achieve adequate infiltration.

OPERATIONS AND MAINTENANCE

The maintenance requirements for vegetated swales are minimal. The swales need to be inspected periodically to remove litter and blockages. Sparsely vegetated areas should be reseeded or replanted to avoid erosion issues.

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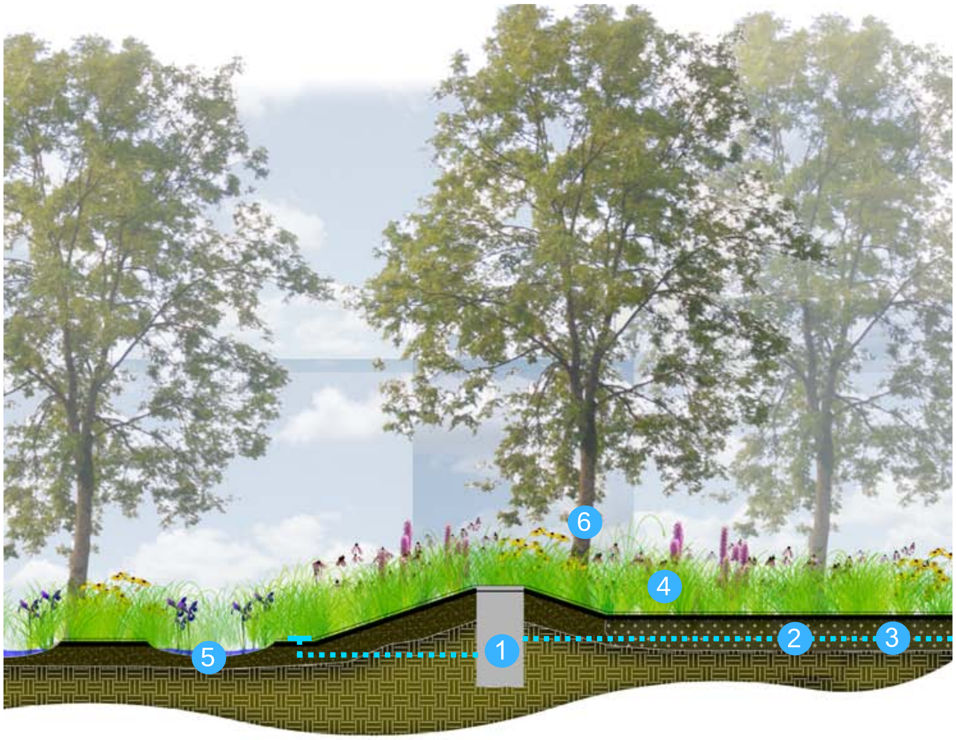
BIOINFILTRATION BASIN

STORMWATER BMP

Shallow, vegetated depressions designed to capture, hold, and infiltrate stormwater runoff to reduce peak flow rates.

Water Control Structure ①
Underdrain ②
Engineered Soil ③
Native Vegetation ④
Restored Wetland ⑤
Stormwater Trees ⑥



SCALE

- ☐ Watershed / County
- ☐ Town / Village
- ☒ Neighborhood
- ☒ Lot

APPLICATION

- ☒ Retrofit
- ☒ Preventative
- ☒ Parking Lots
- ☒ Driveways
- ☐ Lawns
- ☒ New
- ☒ Remedial
- ☒ Streets
- ☐ Roofs
- ☐ Sensitive Areas

EFFECTIVENESS

- ● Runoff Rate Control
- ◒ Runoff Volume Control
- ◒ Habitat Preservation / Restoration
- ● Sediment Control
- ◒ Nutrient Control
- ◒ BOD / COD Control
- ◒ Other Pollutant Control

- ● High
- ◒ Moderate
- ○ Low

DESCRIPTION

Bioinfiltration basins are shallow, vegetated depressions designed to capture and hold a volume of stormwater runoff and allow it to infiltrate into the underlying soils over several days. The design of bioinfiltration basins is simple and they are used as an “end of pipe” method to catch stormwater from swales or storm sewer systems. Bioinfiltration basins allow the stormwater to infiltrate into the soil and recharge groundwater rather than discharging directly into sewers and rivers.

Bioinfiltration basins are very effective at removing pollutants and reducing the volume of runoff from impervious surfaces such as parking lots. Utilizing the Illinois Environmental Protection Agency’s Estimating Pollutant Load Reductions for Nonpoint Source Pollution Control Best Management Practices (BMPs) worksheets, bioinfiltration basins will remove approximately 65% of the total phosphorous, 60% of the total nitrogen, 75% of total suspended solids, and 65% of metals.

BIOINFILTRATION BASIN
STORMWATER BMP


Bioinfiltration Basin in a Neighborhood Setting


Bioinfiltration Collecting Runoff from a Parking Lot


Bioinfiltration in a Park Setting

ADDITIONAL BENEFITS

Bioinfiltration basins provide much more than just stormwater management.

- Enhances the aesthetics of the local landscape.
- Provides habitat for wildlife.
- Provides open space.

DESIGN CONSIDERATIONS

- Bioinfiltration basins must be sized and designed to account for drainage area and soils.
- Infiltration storage should be designed to drain in 24-72 hours.
- Filtration benefits can be improved by planting native-deep rooted vegetation.
- Topsoil should be amended with compost and / or sand as a means of improving organic content for filtering and to achieve adequate infiltration.

OPERATIONS AND MAINTENANCE

The maintenance on bioinfiltration basins include the periodic inspection and cleaning in order to ensure that the system is operating properly. The system should be inspected for clogging of the discharge pipe and sediment accumulation on the basin surface. If a clog is found, rehabilitative maintenance should be conducted immediately to restore its proper operation. In addition, to preventing and repairing clogs, management of the vegetation including mowing, weeding, and replanting sparse areas should also be conducted.

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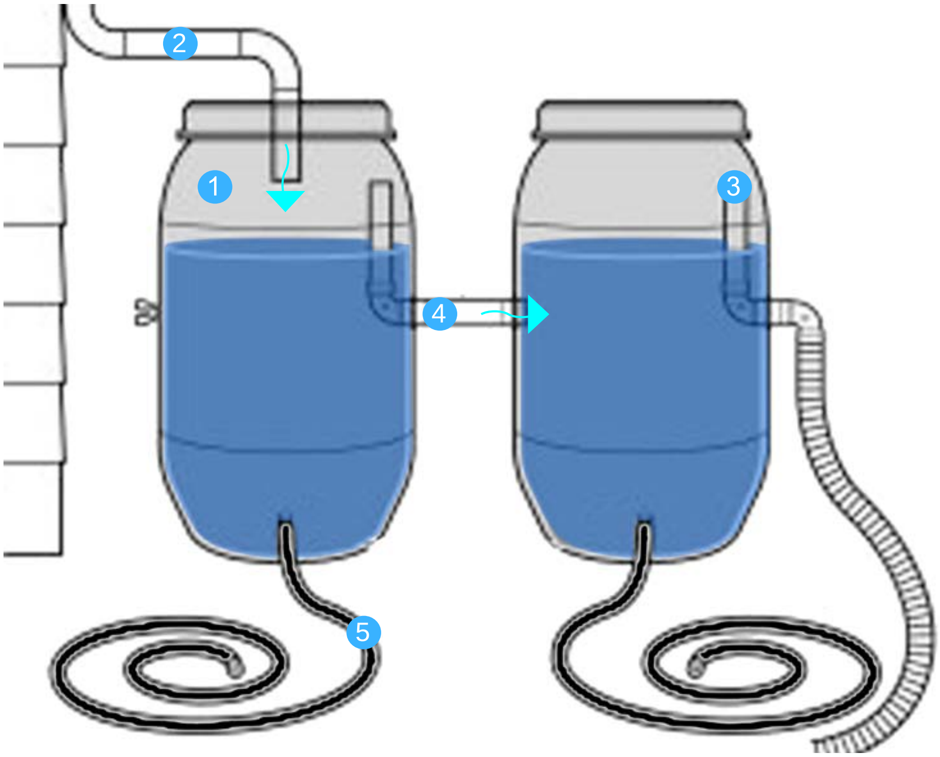
RAIN BARRELS
STORMWATER BMP

Temporary storage for stormwater used to irrigate landscape and garden plants while helping to minimize peak flow rates.

Rain Barrel ①
Downspout Disconnection ②
Overflow to Rain Garden ③
Rain Barrel Link Pipe ④
Garden Hose ⑤



SCALE

☐ Watershed / County
☐ Town / Village
☐ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☐ Parking Lots
☐ Driveways
☐ Lawns
☒ New
☐ Remedial
☐ Streets
☒ Roofs
☐ Sensitive Areas

EFFECTIVENESS

○ Runoff Rate Control
◒ Runoff Volume Control
○ Habitat Preservation / Restoration
○ Sediment Control
○ Nutrient Control
○ BOD / COD Control
○ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

In many urban locations roof runoff is routed directly into the sewer system or adjacent areas that are designed to carry the flow away as swiftly as possible. By installing a rain barrel, it is possible to disconnect these downspouts from the sewer system or capture the runoff that would otherwise be lost and save the rain water for other uses. A rain barrel is a temporary storage system for stormwater. The water captured by the barrel can then be used to irrigate your lawn, flower beds and garden or wash your car. By using a rain barrel you will save money and water by utilizing an ample supply of free ‘soft water’.

How do I design a Rain Barrel for my home?

Rain barrels are designed to accumulate and store runoff from small to moderate storms. A rain barrel is composed of a large drum, hose, pipe and hose couplings, a screen grate and other off the shelf items. Rain barrels can be purchased from garden supply stores or they can be easily built with supplies purchased from a hardware store. Information on where to purchase a rain barrel or assembling one yourself can easily be found online.

The first step in installing a rain barrel at your home is to decide where to place the rain barrel. Many people place their rain barrels near an existing downspout as it simplifies installation. But also be sure you consider how far the location of the barrel is from your plants, gardens, and flowerbeds. You want to be sure you can easily utilize the water that is captured in the rain barrel.

RAIN BARRELS
STORMWATER BMP


Three Tiered Rain Barrel System


Rain Barrel Inlet Filter


Recycled Oak Rain Barrel

Once you have selected the location for your rain barrel, make sure the area is level and free from any rocks, roots, or debris that would cause your barrel to rock from side to side. Also be sure to rake the area in order to remove any leaves that could cause the ground to be soft and unsecure. It is also recommended that prior to placing your rain barrel in its selected location, construct a platform out of cinder blocks, wood, or flat landscape/paver type stones. Raising your rain barrel a few inches off the ground will give you more water pressure when using a hose and make it easier for you to reach the faucet or fill a watering can.

Now that your platform is constructed, place the rain barrel in its location and measure where you need to cut or disassemble your downspout. Often times you can disassemble the downspout at the gutter by removing the bolts or rivets. Replace the portion of the metal downspout removed with a flexible downspout extender. Once securely attached to the gutter, place the downspout extender in the barrel.

COSTS

Rain barrels vary in cost based on size, material and expected lifetime. You can expect to pay between $40 and $150. Purchasing materials and assembling your own rain barrel instead of buying an already assembled rain barrel can reduce this cost.

OPERATIONS AND MAINTENANCE

There are several easy ways to routinely maintain your rain barrel in order to ensure its usefulness for a long period of time. Your barrel should be covered in the warm months to prevent mosquito breeding and should be drained before winter to prevent freezing that could crack the barrel. A mesh filter at the top of the rain barrel will not only prevent insect entry but will also capture debris such as leafs or twigs.

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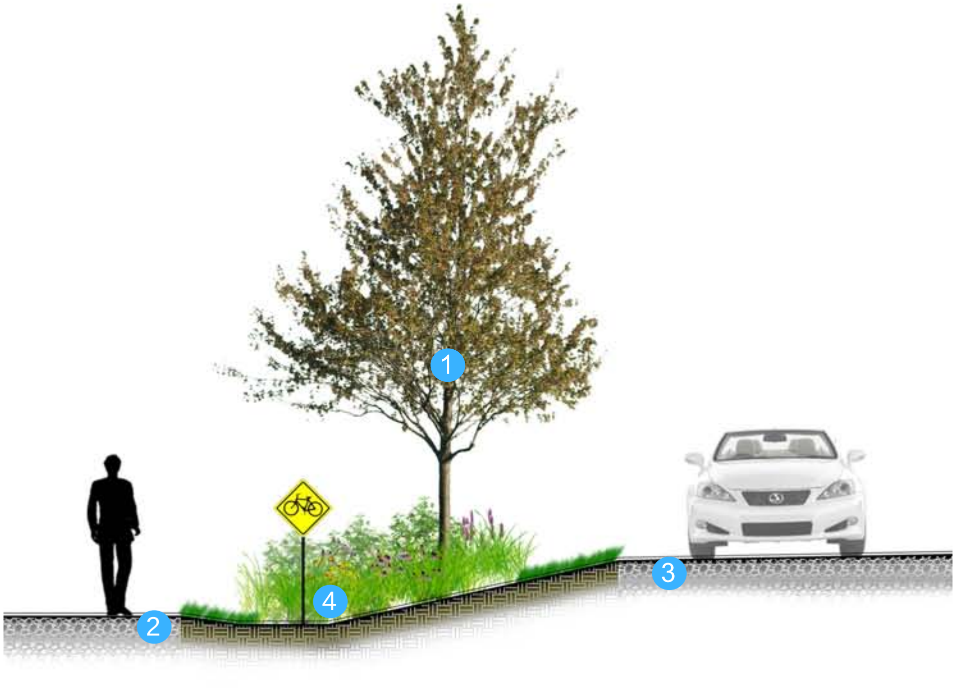
STORMWATER TREES
STORMWATER BMP

Trees help to manage stormwater runoff above the ground surface, at the ground surface, and below the ground surface.



Stormwater Tree ①
Shared-Use Path ②
Road / Parking Lot ③
Vegetated Swale ④

SCALE

- ☒ Watershed / County
- ☒ Town / Village
- ☒ Neighborhood
- ☒ Lot

APPLICATION

- ☒ Retrofit
- ☒ Preventative
- ☒ Parking Lots
- ☒ Driveways
- ☒ Lawns
- ☒ New
- ☒ Remedial
- ☒ Streets
- ☐ Roofs
- ☐ Sensitive Areas

EFFECTIVENESS

- ◒ Runoff Rate Control
- ◒ Runoff Volume Control
- ◒ Habitat Preservation / Restoration
- ◒ Sediment Control
- ◒ Nutrient Control
- ◒ BOD / COD Control
- ◒ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Trees are one of the simplest and most cost effective ways of reducing stormwater runoff from impervious areas such as parking lots, roads, and buildings. Trees have an effect on stormwater above the ground surface, at the ground surface, and below the ground surface.

Above the ground surface, rain is first caught on the trees' leaves, branches, and trunk slowing the movement of the stormwater. A portion of this rainfall is evaporated from the foliage and released back into the atmosphere as vapor. In addition to being evaporated, some of the rainfall caught by the trees is absorbed into the trees' leaves and stems where it is used to sustain health.

Rainfall that makes its way through the tree canopy to the ground surface is absorbed by leaf litter and other organic material commonly located underneath trees, which temporarily reduces peak stormwater runoff rates. In addition, roots and trunks of mature trees create hollows and hummocks on the surface that provides for temporary water storage and ponding.

A small portion of the ponded water is evaporated from the surface while the majority is infiltrated into the soil. The presence of organic matter from leaf litter and other tree detritus and macropores, which are large interconnected pores in the soil created by roots, increases the infiltration rate and the moisture holding capacity of the soils. Once below ground, the stormwater can be taken up by the trees through their roots or percolated into the groundwater. The roots of the trees also act as natural pollution filters removing nitrogen, phosphorous, and potassium from the stormwater before it is able to percolate into groundwater.

STORMWATER TREES
STORMWATER BMP


Trees Planted in a Streetscape
Designed to Manage Stormwater


Trees Planted in a Detention Area


Trees Planted in an Urban Plaza

ADDITIONAL BENEFITS

Trees provide more than just stormwater management.

- Reduces air pollution.
- Provides shade.
- Lowers energy costs if planted to proper locations.
- Prevents soil erosion.
- Reduces noise pollution.
- Enhances aesthetics and increases property values.

OPERATIONS AND MAINTENANCE

Maintenance needs for trees planted for stormwater management is the same for all other trees. Basic tree care should be performed regularly to ensure healthy trees and minimize the risk of damage to people and property.

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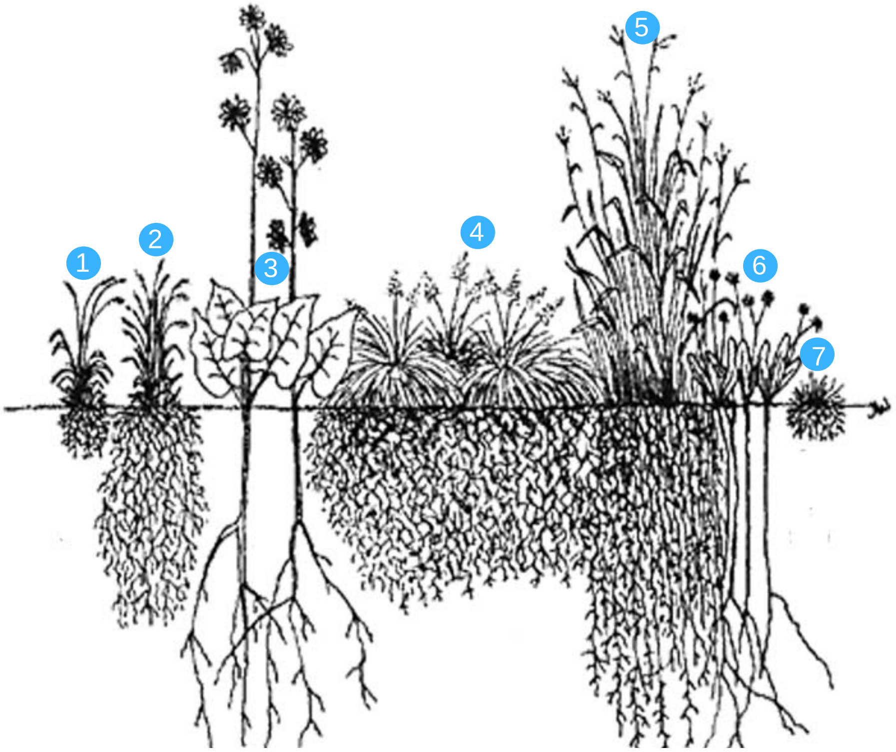
NATIVE VEGETATION
LANDSCAPE BMP

Vegetation historically adapted to a specific geographical region to encourage a healthy and diverse ecosystem.

Smooth Brome (non-native)	①
Little Bluestem	②
Prairie Dock	③
Prairie Dropseed	④
Big Bluestem	⑤
Pale Purple Coneflower	⑥
Kentucky Bluegrass (non-native)	⑦



SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☐ Driveways
☒ Lawns
☒ New
☒ Remedial
☐ Streets
☒ Roofs
☒ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
● Habitat Preservation / Restoration
● Sediment Control
◒ Nutrient Control
◒ BOD / COD Control
◒ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Native vegetation uses plants endemic to a specific geographical region prior to settlement for a variety of purposes including habitat improvement and increasing stormwater infiltration and water quality treatment.

Using vegetation native to a geographical region will encourage a healthy ecosystem which will require less on-going maintenance once established and ultimately be more adaptive to local weather patterns.

When planning a landscape that will incorporate native vegetation it is important to understand the local surroundings of the site. Application of plant material will be different in a urban setting versus a naturalized setting such as a forest preserve. In an urban setting the planting environment is often a very controlled site that must handle rapid water fluctuations, road pollution, visual sight lines, and engineered soils. In a more natural setting the plant application will need to be designed on a broader scale taking the overall watershed and hydrology into account.

NATIVE VEGETATION
LANDSCAPE BMP


Native Landscaping in a Park Setting


Native Wetland Vegetation


Controlled Prairie Burn

ADDITIONAL BENEFITS

- Reduces heating and cooling energy costs if applied appropriately.
- Requires less maintenance than ornamental landscapes once established.
- Reduces urban heat island effect.
- Provides habitat for wildlife.
- Relatively low cost on a per acre basis.

DESIGN CONSIDERATIONS

- When planting native vegetation a site must be designed in a way to closely reflect the natural conditions that the plant species thrive.
- Hydrology is a key component to understand when planning a native restoration project. It will drive the success or failure of native plant communities.
- In residential settings native landscaping is a preference, but can reduce the amount of ornamental invasive species that get planted.

OPERATIONS AND MAINTENANCE

The maintenance requirements for native vegetation will require a long-term maintenance plan in order to achieve desired results, but will depend on the size and scope of the planting.

Large scale planting efforts such as a prairie or large wetland will require a multi-year establishment period of on-going maintenance. Once established maintenance activities can be scaled back, but will still need to be programmed for periodic maintenance, which will include herbicide treatments.

Smaller scale, more urban or residential applications will require the same amount of maintenance a traditional landscape requires. Due to the controlled environment of these areas native plants can't be expected to thrive naturally or without any assistance.

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DEKALB COUNTY COMMUNITY FOUNDATION

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SOIL AMENDMENTS

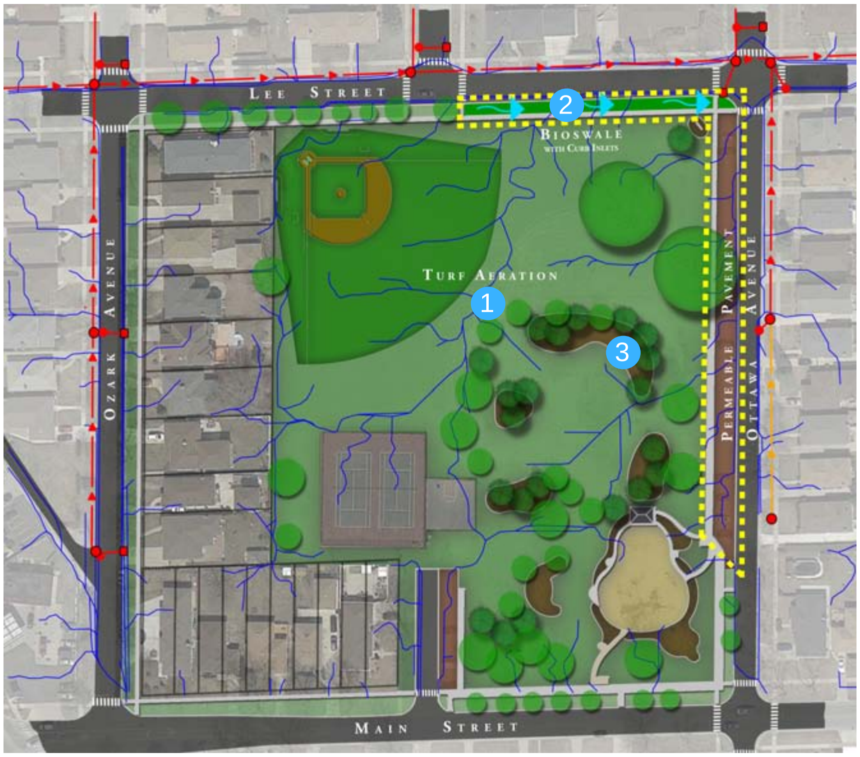
LANDSCAPE BMP

Improves the soil structure to increase water absorption and benefit the health of plant material.

Turf Aeration ①

Engineered Soil in a Bioswale ②

Compost Added to Planting Beds ③



SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☒ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☐ Driveways
☒ Lawns
☒ New
☒ Remedial
☐ Streets
☒ Roofs
☒ Sensitive Areas

EFFECTIVENESS

◐ Runoff Rate Control
◐ Runoff Volume Control
◐ Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◐ Moderate
○ Low

DESCRIPTION

The most common use of soil amendments is to improve the overall soil structure. Soils tend to become compacted over time, which impedes root growth and decreases the ability of plants to take up nutrients and water. Soil amendments add texture and beneficial nutrients to increase the breakdown of organic material and allow for more pore space for water to be stored.

Adding organic materials to the soil composition can result in increased soil moisture for longer periods, stimulate additional microbiological activity, increase nutrient levels and improve plant survival rates. The addition of organic material can greatly improve the water retention abilities of sandy soils and they can be added to adjust the pH of the soil to meet the needs of specific plants or to make highly acidic or alkaline soils more usable.

Soil amendments may be applied in a number of ways. Some are worked into the soil with a tiller before planting. Others are applied after planting, or periodically during the growing season. Soil testing should be performed prior to applying soil amendments to learn more about the composition and structure of the soil. The testing will determine what the current soil is lacking and which supplements to add.

A wide variety of materials are available to improve soil quality. Some examples include: biochar, bone meal, peat, coffee grounds, compost, coir, manure, straw, vermiculite, sulfur, lime, blood meal, compost tea, hydroabsorbant polymers and sphagnum moss. Aerating compacted soil is a temporary solution to increase the health and absorption rates of soils.

SOIL AMENDMENTS

LANDSCAPE BMP

Compost

Lawn Aeration

Engineered Soil in a Rain Garden

ADDITIONAL BENEFITS

Soil amendments provide more than just stormwater management.

- Enhances the growth of vegetation.
- Relatively low-cost benefit.

DESIGN CONSIDERATIONS

- Soil testing should be done before adding supplements to determine what exactly is needed to improve the soil structure.
- The purpose of amending the soil needs to be kept in mind. Drainage, water retention, and plant health all contribute to mixing ratios.
- If the area being amended is going to be an active use area for recreational activities, absorption and the ability for evaporation need to be considered.

OPERATIONS AND MAINTENANCE

The maintenance requirements for amended soils is minimal. Once the soil is amended there is not much more maintenance needed. Monitoring of the plant material is necessary to determine if the soil needs to be amended further.

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STREAMBANK STABILIZATION
LANDSCAPE BMP

Includes the use of bioengineering techniques to address streambank erosion and protect private property, roadways, and utilities from damage.

Live Vegetation Stakes ①

Cobbles ②

SCALE

- ☒ Watershed / County
- ☒ Town / Village
- ☒ Neighborhood
- ☐ Lot

APPLICATION

- ☒ Retrofit
- ☒ Preventative
- ☐ Parking Lots
- ☐ Driveways
- ☐ Lawns
- ☒ New
- ☒ Remedial
- ☐ Streets
- ☐ Roofs
- ☐ Sensitive Areas

EFFECTIVENESS

- ○ Runoff Rate Control
- ○ Runoff Volume Control
- ● Habitat Preservation / Restoration
- ● Sediment Control
- ◒ Nutrient Control
- ◒ BOD / COD Control
- ◒ Other Pollutant Control

- ● High
- ◒ Moderate
- ○ Low

DESCRIPTION

Streambank erosion can be a dangerous and costly problem, especially after large rainfalls or floods. Excess runoff from urbanized areas, and wave action along lakeshores continually erode soil. Erosion can be severe depending on the surrounding watershed and hydrology. Traditional methods of controlling streamflow erosion have relied on structural practices like rip rap, retaining walls, and sheet piles. In some cases, these methods are expensive, ineffective, or unappealing. Structural practices can be combined with plant material to stabilize a streambank in a more appealing and also permanent manner.

An alternative approach is bioengineering, a method of construction using live plants alone or combined with dead or inorganic materials, to produce living, functioning systems to prevent erosion, control sediment, and provide habitat.

Bioengineering uses combinations of structural practices and live vegetation to provide erosion protection for hillslopes, streambanks, and lakeshores. Bioengineering is a diverse and multidisciplinary field, requiring the knowledge of engineers, botanists, horticulturists, hydrologists, soil scientists, and construction contractors.

STREAMBANK STABILIZATION

LANDSCAPE BMP

Vegetated Bank Stabilization

Rip-Rap Bank Stabilization

Gabion Bank Stabilization

ADDITIONAL BENEFITS

Stabilizing streambanks provide more than just stormwater management.

- Prevents the loss of land or damage to utilities, roads, buildings or other facilities adjacent to a watercourse, and prevent the loss of stream bank vegetation.
- Reduces sediment loads to streams.
- Maintains the capacity of the stream channel.
- Improves the stream for recreational use or as habitat for fish and wildlife.
- Controls unwanted meander of a river or stream.

DESIGN CONSIDERATIONS

- If the banks are eroding due to a natural meander, then it may be best to leave the bank alone. If the banks are eroding due to fluctuations in hydrology, the hydrologic fluctuations should be addressed before the banks are stabilized.
- Determine the goal in stabilizing the stream banks. Some banks are stabilized to protect buildings and land. Others are stabilized to reduce sediment loads into nearby water bodies.
- The purpose for stabilizing the banks and the users of the stream will help determine the type of structures needed.
- Studying the entire watershed will help prioritize bank stabilization efforts.

OPERATIONS AND MAINTENANCE

A maintenance plan should be prepared by a qualified engineering firm and indicate when inspections of the site will be made and who will be responsible for needed maintenance. Site inspections, conducted to ensure the stream bank structures are staying intact, are particularly important within the first few months of installation and following storm events.

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STREAM / WETLAND MANAGEMENT & RESTORATION

LANDSCAPE BMP

Landscape restoration practices designed to maintain existing remnant landscapes and restore streams and wetlands to their natural state.

Wetland ①
Upland ②
Woodland ③
Stream / River ④
Recreational Opportunities ⑤

SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☐ Lot

APPLICATION

☐ Retrofit
☒ Preventative
☐ Parking Lots
☐ Driveways
☐ Lawns

☐ New
☒ Remedial
☐ Streets
☐ Roofs
☒ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
● Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◐ Moderate
○ Low

DESCRIPTION

Stream and wetland restoration is an important component in helping to enhance a watersheds ecological and hydraulic functions. Historically wetlands have been drained and filled to accommodate expanding development and large scale agriculture. These areas typically retain their characteristic soils and hydrology, which allows for their natural state to be reclaimed.

Restoration is a multi-stage process that requires planning, implementation, monitoring, and management on a long-term basis to ensure the vitality and health of the ecosystem. By reclaiming these areas and restoring them back to wetlands it helps to enhance water quality and water quantity that is entering local streams and rivers. This has a profound effect on the local watershed as well as neighboring watersheds.

Developing a watershed plan is the first step in identifying areas that would benefit from restoring and managing stream corridors and wetlands.

STREAM / WETLAND MANAGEMENT & RESTORATION

LANDSCAPE BMP

Wetland Restoration

Wetland Restoration

Stream and Wetland Restoration

ADDITIONAL BENEFITS

- Improves aquatic habitat for fish and other organisms.
- Increases channel stability and streambank protection.
- Riparian establishment.
- Stabilizes water control structures.
- Improves water quality.
- Provides educational and recreational opportunities.

DESIGN CONSIDERATIONS

- Streams and wetlands need to have an existing conditions assessment performed in order to determine future steps to aid in restoration.
- Once the stream network and hydrology has been analyzed, site specific alterations and programming can be determined. This includes draintile rerouting, invasive species control, water control structures, and riparian buffer establishment.

OPERATIONS AND MAINTENANCE

A long-term maintenance plan should be developed to ensure the health of the restored areas. Establishment of planting enhancements to promote biodiversity will need to be maintained on a regular basis. Continued programming of the restored site is essential as the surrounding environment and hydrology changes.

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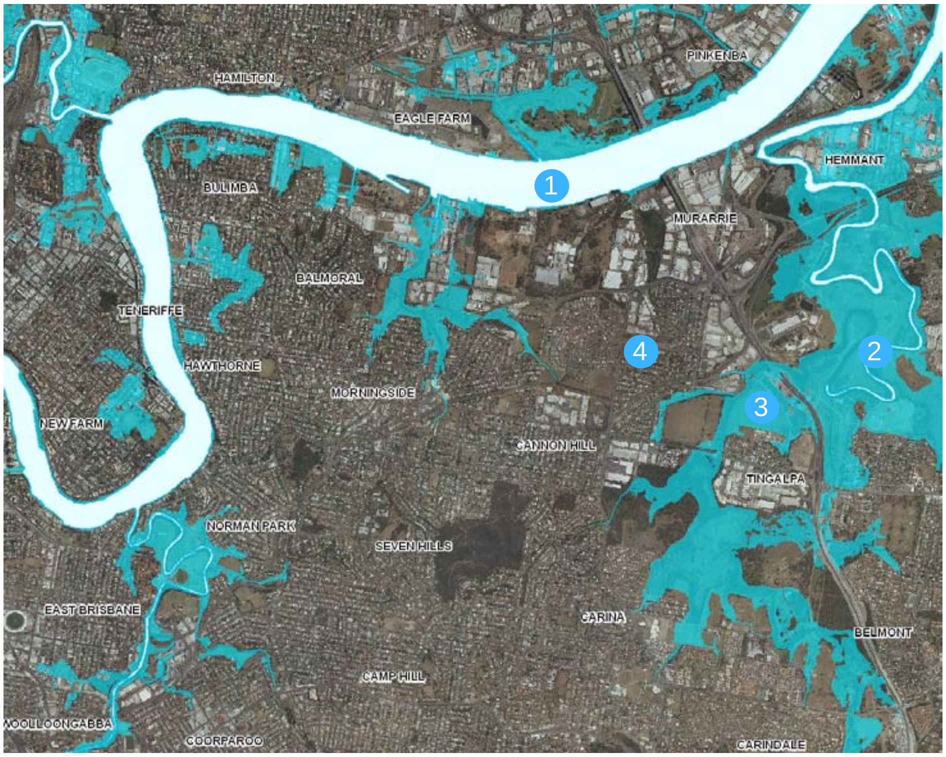
NON-STRUCTURAL FLOOD CONTROL

FLOOD REDUCTION BMP

Includes floodproofing, acquisition and demolition of flood damaged buildings, and elevating or relocating buildings out of the floodplain.



River ①

Tributaries ②

Floodplain Analysis ③

Development ④

SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☐ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☐ Parking Lots
☐ Driveways
☐ Lawns
☒ New
☒ Remedial
☐ Streets
☐ Roofs
☐ Sensitive Areas

EFFECTIVENESS

● Runoff Rate Control
● Runoff Volume Control
● Habitat Preservation / Restoration
● Sediment Control
● Nutrient Control
● BOD / COD Control
● Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Non-structural flood control measures include floodproofing, acquisition and demolition of flood damaged building, and elevating or relocating buildings out of the floodplain. Non-structural measures include modifications in public policy, management practice, regulatory policy and pricing policy

Reducing Hazardous Uses of Floodplains:
Limiting and directing the development that takes place in the floodplain is another approach to mitigating the impacts of a flood.

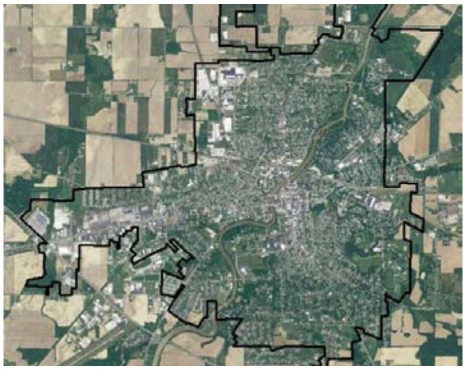
Building Codes:
Building codes and construction codes regulate the materials used in construction, site preparation and construction method. Requiring water resistant materials like: metal doors; windows and jambs that do not warp when inundated and raising and protecting utilities are some examples of these measures.

Design and Location of Services and Utilities:
State and local governments can direct development to low risk areas. Discretion can be used in providing services that spur development. By carefully evaluating the extension of roads and utilities, the locations of schools, libraries, hospitals and the like, future development patterns can be influenced.

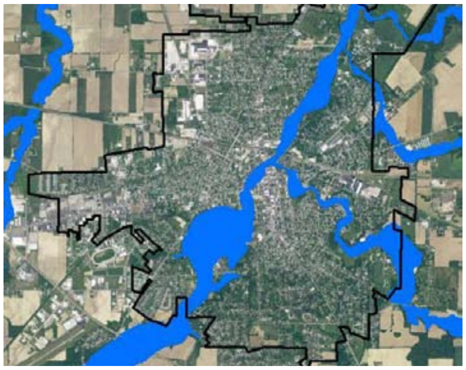
Housing Codes:
Housing codes set minimum standards for the occupancy of residential units. Special standards can be specified for houses occupying flood prone areas. Housing codes affect existing houses whereas building codes affect future houses.

NON-STRUCTURAL FLOOD CONTROL

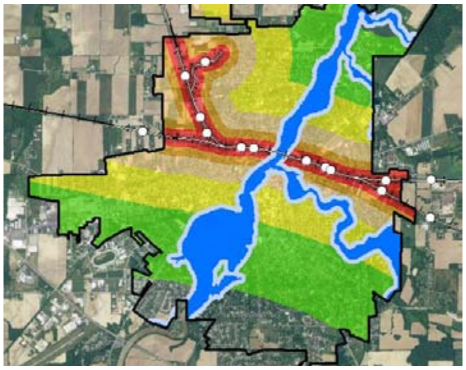
FLOOD REDUCTION BMP



GIS Analysis



Floodplain Analysis



Combined GIS Layer Analysis

ADDITIONAL BENEFITS

Public Acquisition:
Public acquisition is the purchase of floodplain lands, flow easements or development rights to reduce existing or limit future flood damages. Lands, particularly in the floodway, can be purchased to maintain the carrying capacity of existing floodplains.

Relocation:
Relocation is the permanent removal of structures or other improvements from the floodplain, resituating them on alternative, flood free sites.

Sanitary and Well Codes:
Sanitary and well codes establish minimum standards for and protect the water supply and wastewater collection systems from contamination and damage from floods.

Subdivision Regulations:
Subdivision regulations guide the process by which large parcels of land are divided into smaller developable plots. They also control improvements such as roads, sewers, water and recreation areas. By requiring drainage, prohibiting encroachment on floodplains, requiring elevation of structures and locating streets and utilities in low risk areas damages can be minimized.

Tax Adjustments:
State and local taxes can be used to discourage inappropriate uses of the floodplain and to encourage desirable uses.

Urban Storm Drainage:
Urban storm drainage systems must be adequately designed, constructed and maintained to allow storm waters to drain from impermeable surfaces. Designing systems with room to grow to accommodate future development and increases in future storm flows can effectively reduce flood damages. Storm water detention and infiltration opportunities may also be provided as part of the system.

Zoning Codes:
Zoning divides an area into specified areas for the purpose of regulating: (1) the type and use of structures and land, (2) the height and bulk of structures and (3) the size of lots and density of use. Floodways are designated so that any development permitted in the remainder of the floodplain will not result in a stage increase beyond a prescribed amount of a given frequency flood at a specific location.

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STRUCTURAL FLOOD CONTROL

FLOOD REDUCTION BMP

Engineered solutions designed to reduce the risk of flood damage in urbanized areas.

Underdrained Detention Basin ①

Stormsewer Outfalls ②

Stormsewer Improvements ③

Programmed Recreational Space ④

SCALE

☒ Watershed / County
☒ Town / Village
☒ Neighborhood
☐ Lot

APPLICATION

☒ Retrofit
☒ Preventative
☒ Parking Lots
☒ Driveways
☐ Lawns
☒ New
☒ Remedial
☒ Streets
☐ Roofs
☐ Sensitive Areas

EFFECTIVENESS

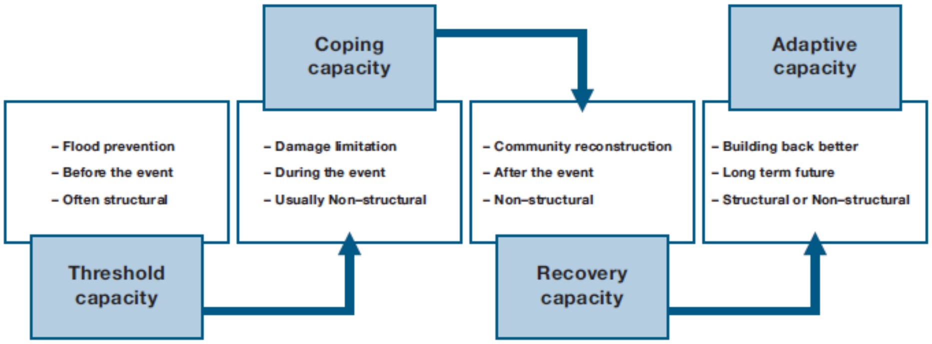
● Runoff Rate Control
● Runoff Volume Control
○ Habitat Preservation / Restoration
◒ Sediment Control
◒ Nutrient Control
◒ BOD / COD Control
◒ Other Pollutant Control

● High
◒ Moderate
○ Low

DESCRIPTION

Structural flood control measures include reservoirs, levees, floodwalls, diversions, stream channel conveyance improvements, and stormsewer improvements. These measures are generally designed to reduce the risk of flood damage in urbanized areas. Structural flood control projects are frequently cost prohibitive for municipalities to implement without some type of assistance through cost sharing or grants.

Heavily-engineered structural measures can be highly effective when used appropriately, but they tend to transfer flood risk from one location only to increase it in another. In some circumstances this is an acceptable and appropriate approach to flood control, while in others it may not be. The best and most often used methods include an integrated approach combining both structural and non-structural methods.



Four Capacities Towards Increased Resilience (Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century)

STRUCTURAL FLOOD CONTROL

FLOOD REDUCTION BMP


Water Control Structure


Spillway Outlet


Stormsewer Construction

ADDITIONAL BENEFITS

- Provides protection to existing buildings located in floodplains including residential dwellings.
- Allows for the integration of bioengineering methods to be utilized for an integrated flood control approach.
- Reduces Combined Sewer Overflows from entering residential basements.
- Helps to reduce erosion along high velocity stream and river corridors.

DESIGN CONSIDERATIONS

- Site conditions such as adjacent land uses, soil type, and slopes should be assessed to determine if a structural flood control solution is appropriate.
- A pretreatment system of surface runoff is beneficial to maintain the functionality of an engineered system to reduce peak low rates.
- In large storm events the surface flow can exceed capacity of the designed system. Thus, a series of overflow systems will need to accommodate the influx of surface runoff.
- The drainage area or local watershed will need to be determined in order to design for appropriate solutions.

OPERATIONS AND MAINTENANCE

Flood control structures should be inspected annually and after large storm events to assure structures are still fully functioning. Log jams and other debris can often times cause issues along stream and river corridors. Storm Sewers will need routine maintenance to suck out sediment to prevent backups.

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Chapter 5.0 Prioritized Action Plan

5.1 Introduction

A Prioritized Action Plan has been developed for the East Branch of the South Branch Kishwaukee River Watershed to provide stakeholders guidance on action items for watershed improvement practices. The Prioritized Action Plan serves as a "roadmap" for the implementation of the watershed-based plan and includes recommended watershed-wide and site specific best management practices (BMPs), a prioritized schedule for the implementation of the BMPs, recommendations on agencies and organizations responsible for plan implementation, and estimated BMPs costs.

The Prioritized Action Plan is divided into four subsections:

- Programmatic Action Plan
- Site Specific Action Plan
- Water Quality Monitoring Plan
- Education and Outreach Plan

The Programmatic Action Plan (Section 5.3) is focused on watershed-wide action items that are not site specific while the Site Specific Action Plan (Section 5.4) identifies specific and actual locations where water quality, hydrological modification, and/or flood reduction/prevention projects can be implemented. The Action Items were selected based on their ability to reach the goals and objectives identified by the Watershed Steering Committee for the East Branch of the South Branch Kishwaukee River Watershed (see Chapter 2.0). For each Watershed-wide and Site Specific recommendation a priority ranking was assigned. Additionally, estimated costs and responsible entities for project implementation are also provided.

Section 5.5 includes the Water Quality Monitoring Plan. The Action Items identified in this plan have not been prioritized. However, recommendations on who, what and where the recommendations should be implemented are included.

Section 5.6 includes the Education and Outreach Plan. The Education and Outreach Plan highlights recommended actions that will need additional outreach and education in order to be implemented.

The six most important recommendations are summarized as follows:

1. Remediate existing flood problems and prevent future flooding by reducing stormwater runoff and restoring areas for surface water storage and absorption such as floodplains, depressional storage areas, and wetlands, which also provide water quality improvement benefits.
2. Restore and manage stream corridors by restoring native riparian buffers, removing excessive debris, and stabilizing the streambed and streambanks with practices that also enhance habitat.

3. Use better stormwater management and low impact development practices for new and existing development that slow, filter, infiltrate, cool, and cleanse stormwater runoff.
4. Modify and use planning and development standards, policies, and capital improvement plans and budgets to protect and enhance water quality.
5. Provide public education and outreach to enhance understanding and appreciation of watershed resources and problems and to provide opportunities for people to get involved in watershed improvement activities.
6. Monitor and evaluate watershed plan implementation and physical watershed conditions to gauge progress towards watershed goals.

5.2 Implementation Partners

Implementation of the Prioritized Action Plan cannot be the responsibility of one watershed stakeholder. Successful plan implementation will require coordination and partnerships between numerous stakeholders in the watershed. Key stakeholders in the East Branch of the South Branch Kishwaukee River Watershed are listed in Table 5-1. A brief description of each stakeholder's role in watershed-plan implementation is also included.

Table 5-1 Key Watershed Stakeholders

Watershed Stakeholders	Abbreviation
Corporate and Business Landowners	CBL
Counties	C
DeKalb Community Foundation	DCCF
DeKalb County Highway Department	DCHD
DeKalb County Forest Preserve District	DCFP
DeKalb County Stormwater Management Committee	DCSWMPC
DeKalb County Watershed Steering Committee	DCWSC
Developers and Builders	DB
Drainage Districts	DD
Educational Institutions	EI
Federal Emergency Management Agency	FEMA
Forest Preserve District of Kane County	FPDKC
Golf Courses	GC
Illinois Department of Natural Resources	IDNR
Illinois Department of Transportation	IDOT
Illinois Emergency Management Agency	IEMA
Illinois Environmental Protection Agency	Illinois EPA
Kane County Department of Transportation	KCDOT
Kishwaukee Ecosystem Partnerships	KREP
Municipalities	MUN
Park Districts	PD
Residents/Owners	RO
Soil Water Conservation District	SWCD
Townships	TOWN
US Army Corps of Engineers	USACE
US Department of Agriculture	USDA
US Environmental Protection Agency	US EPA
US Fish and Wildlife Service	US FWS

Corporate and Business Landowners (CBL)

The active participation of CBLs in the planning process can lead to positive impacts on the quality of the East Branch South Branch Kishwaukee Creek Watershed. Businesses and commercial properties can become involved by retrofitting existing detention basins and swales, managing their grounds, roof runoff, and parking lots to reduce stormwater runoff volume and pollutant loadings, and sponsoring watershed events. Coordination with the CBL community can also lead to new development designed to minimize runoff and pollutant loadings.

Counties (C) including DeKalb and Kane

The Counties are responsible for land use planning, development, natural resource protection, and drainage system management in the unincorporated areas of the East Branch South Branch Kishwaukee Creek Watershed. Working with the Counties and their public works, development, water resources, health, and transportation departments, can help ensure responsible, sustainable land use planning, road and sewer maintenance, and public health policies for the watershed.

DeKalb County Community Foundation (DCCF)

The DeKalb County Community Foundation is committed to providing tools and resources to enhance land use planning within the County through a watershed-based approach and provided the local cash match for the watershed-based planning grant. DCCF holds a position on the DeKalb County Watershed Steering Committee. The DCCF Land Use Committee composed of DCCF board members and community stakeholders, prioritizes and funds eligible projects to implement and enhance the County's watershed-based plan and supports watershed planning opportunities for the balance of the County.

DeKalb County Highway Department (DCHD)

DCHD is responsible for the planning, construction, and maintenance of county highways located in the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into road projects can help improvethe environmental quality of the watershed.

DeKalb County Forest Preserve (DCFP)

The DeKalb County Forest Preserve District carries out a broad range of ecological restoration and maintenance activities intended to address our core mission: acquire lands to "preserve, protect and restore the flora, fauna and natural beauties, as near as may be, in their natural state and condition, for the education and recreation of our citizens". The DeKalb County Forest Preserve District manages 16 preserves with woodlands, prairies, wetlands and waterways and within the East Branch South Branch Kishwaukee River watershed the Forest Preserve maintains the Great Western Trail.

DeKalb County Stormwater Management Committee (DCSWMPC)

The DeKalb County Stormwater Management Planning Committee is responsible for the creation for the County-wide Stormwater Management Plan and Ordinance. The Committee provides direction for the Plan's implementation and coordinates the County-wide Stormwater Management Ordinance with the municipalities within the boundaries of the County. The Committee monitors and evaluates the implementation of the County-wide

Stormwater Management Plan and Ordinance, and recommends updates and amendments when deemed necessary or appropriate.

DeKalb County Watershed Steering Committee (DCWSC)

The DeKalb County Watershed Steering Committee (DCWSC) is a consortium of municipalities in the watershed, resource agency professionals, environmental advocates, and local residents that established itself to guide the development of strategies to protect and restore the East Branch South Branch Kishwaukee River and its tributaries. It is likely that DCWSC will be the primary lead for the implementation of the watershed-based plan.

Developers & Builders (DB)

As discussed previously in the watershed-based plan, the design and construction of properties can significantly impact a watershed. Developers should be encouraged or required to utilize development techniques that protect water quality and stream health. Builders should properly install and maintain BMPs during the construction phase in order to reduce the potential for sediment-bearing water to be discharged to creek and natural areas.

Drainage Districts (DD)

Drainage districts are local bodies formed for the purpose of draining, ditching, and improving land for agricultural and sanitary purposes.

Educational Institutions (EI)

There are numerous educational institutions such has Sycamore High School and Northern Illinois University located within and near the watershed that can have an integral role in implementing the watershed plan. These educational institutions have expertise in water quality monitoring and environmental education that can be used to support watershed protection and improvement initiatives.

Federal Emergency Management Agency (FEMA)

FEMA is the principal federal agency involved in flood mitigation and flood disaster response. FEMA is responsible for the National Flood Insurance Program, helps municipalities develop and enforce floodplain ordinances, develops floodplain maps, and administers funding for flood mitigation plans and projects.

Forest Preserve District of Kane County (FPDKC)

The Forest Preserve District of Kane County owns and manages a number of acres of open space within the East Branch South Branch Kishwaukee River Watershed. Issues related to the protection and management of these and potential future FPD holdings will rely in part on the FPDKC.

Golf Courses (GC)

Golf courses can help reduce pollutant loadings, especially nutrients, as well as runoff volume by incorporating BMPs into their golf course management programs.

Illinois Department of Natural Resources (IDNR)

Several offices within IDNR provide services that will be key to the implementation of the East Branch South Branch Kishwaukee Creek Watershed Plan for issues related to water resource management, habitat protection and management, wildlife management, invasive species control, and wetland management.

- The Office of Water Resources (OWR) is responsible for the regulation of floodplain development as well as for the implementation and funding of structural flood control and mitigation.
- The Office of Realty and Environmental Planning (OREP) is responsible for natural resource and outdoor recreation planning. It also administers the Conservation 2000 Ecosystems Program, which provides technical and financial assistance through a grant program for natural resource protection.
- The Office of Resource Conservation (ORC) reviews Clean Water Act Section 404 wetland permits for impacts on fish and wildlife resources; it manages threatened and endangered species issues; it also protects fisheries and other aquatic resources through regulation, ecological management and public education.

Illinois Department of Transportation (IDOT)
IDOT Region 3 is responsible for the planning, construction, and maintenance of portions of the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into IDOT projects can improve the environmental quality of the watershed.

Illinois Emergency Management Agency (IEMA)
IEMA is responsible for flood and disaster planning, emergency response, and hazard mitigation. IEMA works with local governments on flood mitigation plans and provides operational support during floods. IEMA also administers FEMA-funded programs in the state, including flood mitigation grant programs.

Illinois Environmental Protection Agency (Illinois EPA) Bureau of Water
The Illinois EPA is responsible for the protection of the state's water resources and ensuring that Illinois' rivers, streams and lakes will support all uses for which they are designated including protection of aquatic life, recreation and drinking water supplies. The Illinois EPA also provides technical assistance and administers several state and federal grant programs, including Section 319 funding, which helps local governments, not-for-profits, and other stakeholders to complete projects that are aimed at reducing nonpoint source pollution.

Kane County Division of Transportation (KCDOT)
KDOT is responsible for the planning, construction, and maintenance of county highways located in the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into KDOT projects can help lead to improvements in the environmental quality of the watershed.

Kishwaukee River Ecosystem Partnership (KREP)
The Kishwaukee River Ecosystem Partnership is a group of open space agencies, conservation organizations and local governments in the Kishwaukee River watershed organized under the auspices of the Illinois Department of Natural Resources to protect and restore the high water quality and habitat values of the river and its tributary streams.

Municipalities (all departments) (MUN)
Municipalities (i.e., local elected officials and local agency staff) have the principal responsibility for land use and development planning, establishing legislative and administrative policies, adopting ordinances and resolutions, setting zoning standards, establishing the annual budget, appropriating funds, and setting tax rates. Municipalities are a critical stakeholder in watershed protection efforts because they are responsible for the enforcement of local land use and development ordinances.

Parks Districts (PD)
Park Districts maintain numerous recreational facilities and parks in the watershed. Partnerships with local park districts can help ensure the preservation of open space while also facilitating recreational and other community opportunities that can help increase support for watershed protection efforts.

Residents and Owners (RO)
The activities of residential landowners, often unknowingly, can have a significant impact of the quality of a watershed. Practices such as excessive lawn fertilization application, disposal of trash and yard waste in waterways or encroachment riparian buffers can be significant sources of nonpoint pollution. Recommendations of the watershed-based plan should include development of education and outreach programs that inform residents about potential consequences of their actions and present alternative actions. Additionally, political pressure from local residents on municipal, township, county, state and federal officials can lead to increased efforts focused on water quality protection and flood remediation.

Soil and Water Conservation Districts (SWCD) including DeKalb and Kane/DuPage
Soil & Water Conservation Districts are locally operated units of government functioning under Illinois law. The SWCD's mission is to promote the protection, restoration, and wise use of the soil, water, and related resources within the district. They provide technical and educational resources in the areas of soils and land use, water quality, soil erosion in both urban and agricultural land uses, conservation program needs, wildlife habitat, and native ecosystem restoration and management.

Townships (TOWN)
While unincorporated townships generally play a secondary role in watershed protection, they often have responsibility for road upkeep and occasionally sponsor drainage system improvement projects. The use of BMPs by townships, especially for road maintenance, can help improve water quality and stream habitat within the watershed.

U.S. Army Corps of Engineers (USACE)
USACE plays a major role in wetland protection and regulation through Section 404 of the Clean Water Act, which requires USACE to administer permit applications for alterations to wetlands that are considered Waters of the United States.

U.S. Department of Agriculture (USDA)
USDA's Farm Services Agency (FSA) has several programs that support watershed protection and restoration efforts. Under the Conservation Reserve Program (CRP), farmers receive annual rental payments, cost sharing, and technical assistance to plant vegetation for land they put into reserve for 10 to 15 years. The Conservation Reserve Enhancement

Program (CREP) targets state and federal funds to achieve shared environmental goals of national and state significance. The program uses financial incentives to encourage farmers and ranchers to voluntarily protect soil, water, and wildlife resources. The Grassland Reserve Program (GRP) uses 30-year easements and rental agreements to improve management of, restore, or conserve up to 2 million acres of private grasslands. The USDA Natural Resource Conservation Service (NRCS) Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on tribal and private working lands. The USDA NRCS Environmental Quality Improvement Program (EQIP) provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.

U.S. Environmental Protection Agency (USEPA)
The USEPA oversees the environmental protection efforts of the Illinois EPA and is the ultimate source for Section 319 and other environmental improvement programs. Section 404 of the Clean Water Act, which regulates the dredging and filling of wetlands, is jointly administered by USEPA and the U.S. Army Corps of Engineers.

U.S. Fish and Wildlife Service (USFWS)
The USFWS provides technical assistance to local watershed protection groups. It also administers several grant and cost-share programs that fund wetland and aquatic habitat restoration. The USFWS also administers the federal Endangered Species Act and supports a program called Endangered Species Program Partners, which features formal or informal partnerships for protecting endangered and threatened species and helping them to recover. These partnerships include federal partners as well as states, tribes, local governments, nonprofit organizations, and individual landowners.

5.3 Programmatic Action Plan

The Programmatic Action Plan includes recommended BMPs that are applicable watershed-wide and has been divided into two sections. The first section is focused on recommendations that are applicable across the watershed to meet the goals identified by the Watershed Steering Committee. The second section provides a review of the existing stormwater and development ordinances applicable in the watershed and provides recommendations for changes aimed at improving water quality and stream health and the reduction of flooding in the watershed.

Section 5.3.1 Programmatic Action Plan

As discussed in Chapter 2, the watershed-wide goals identified by the Watershed Steering Committee include:

A. Protect and enhance overall surface and groundwater quality in the East Branch South Branch Kishwaukee River Watershed
B. Reduce existing flood damage in the watershed and prevent flooding from worsening

C. Improve aquatic and wildlife habitat in the East Branch South Branch Kishwaukee River Watershed
D. Develop open space in the East Branch South Branch Kishwaukee River Watershed and provide recreational opportunities
E. Increase coordination between decision makers and other stakeholders in the Watershed.
F. Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

The Programmatic Action Plan includes measures related to each goal. This Programmatic Action Plan includes remedial, preventative, regulatory, and maintenance action items that are applicable throughout the watershed. This Programmatic Action Plan should be considered as general guidance for all watershed stakeholders and plan implementers.

The Programmatic Action Plan is presented in table format (Tables 5-2 to 5-7). The tables include the recommended action item/BMP, priority, cost, responsible lead agencies or organization with greatest potential to implement the recommendation, and support agencies or agencies who could assist with technical, financial, or regulatory assistance or whose programs may be impacted by the recommendations. Each recommendation is given a unique ID number (ID#). As some recommendations appear in multiple tables, the ID number will link these recommendations.

Cost estimates are only provided for best management practices that involve construction or engineering costs such as streambank stabilization, native plantings, and feasibility studies. Costs are not included for preventative measures such as outreach and educational programs or regulatory actions. The cost estimates are included for advisory purposes only. The cost estimates are concept level costs and are most useful to compare the relative costs of the recommended BMPs. More detailed costs can be developed when site constraints are more fully investigated and preliminary engineering is conducted.

Each of the BMPs was assigned a priority status and classified as high (H), medium (M), or low (L). Priority status was assigned based on need, cost, potential funding opportunities, and technical needs. High priority action items should be considered short-term goals (1-5 years) while medium and low priority action items are considered long-term goals (greater than 5 years).

Goal A: Protect and enhance overall surface and groundwater quality in the East Branch South Branch Kishwaukee River Watershed

Objectives

1) Implement stormwater best management practices (BMPs) throughout the watershed to improve water quality by reducing nonpoint source pollution.
2) Restore riparian buffers along East Branch South Branch Kishwaukee River and its tributaries.
3) Promote conservation tillage practices to reduce soil erosion and sedimentation
4) Promote nutrient management both in the rural and urban setting to alleviate the over application of nutrients

5) Encourage decision makers to undergo a groundwater study that includes detailed analysis of groundwater use and development of regulatory programs/recommendations aimed at protecting and improving groundwater quality.

As discussed in Chapter 3, stormwater runoff is one of the primary sources of water quality impairment in the watershed. The causes and sources of water quality impairment in the East Branch South Branch Kishwaukee River watershed are directly related to the existing land use in the watershed. As the land use in the watershed moves from natural to agriculture to urban, corresponding modifications of the steam channel, floodplain, wetlands, and riparian corridor have and will continue to occur. In the late 1800s as people moved into the watershed, they drained wetlands by excavating ditches as a means of removing water so that the land could be used for agriculture. It appears that the majority of the streams that make up Virgil Ditch #1, Virgil Ditch #2, Virgil Ditch #3, and Union Ditch #2 were manmade. These manmade ditches are unstable and channelized. Additionally, the natural occurring stream channels of Union Ditch #1, Union Ditch #3, and the East Branch South Branch Kishwaukee River were also channelized during the late 1800s and early 1900s as a means of increasing flow capacities to move water away from the agricultural field as quickly as possible.

There are problems resulting from the channelization of streams and manmade ditches. Channelization is detrimental for the health of streams and rivers through the elimination of suitable instream habitat for fish and wildlife by limiting the number of natural instream features such as pool-riffle sequences in the channel. Additionally, in many locations, a berm comprised of historic side-cast dredge spoils cuts off the stream channels from the floodplain.

Additionally, hydromodification, defined as human induced activities that change the dynamics of surface or subsurface flow, is prevalent in the watershed. Impacts from hydromodification can be seen as early as the late 1800s with the draining of wetlands, construction of the ditches, and the channelization of streams to increase agricultural production. Early settlers of the Midwest quickly realized that the soils found under wetlands and wet prairies were ideal for crop production once the water was removed. In order to "dry" the wetlands and the wet prairies, systems of sub-surface drainage tiles were installed in order to re-route the groundwater away from the wetlands and wet prairies and discharged into streams and ditches. Given that the drain tiles were drained by gravity flow, the receiving surface water needed to be a lower elevation than the tile. As such, ditches were installed and naturalized stream channels were often excavated to a deeper depth and straightened to facilitate quicker drainage of the fields. Once the water was removed, these areas could be put into successful agricultural production. This creation of agricultural land was at the cost of the loss of wetlands, wet prairies, and riparian habitat. Hydromodification attributed to the installation of drain tiles is prevalent throughout the East Branch South Branch Kishwaukee River.

Starting in the mid-1900s, the municipalities in the watershed including the City of Sycamore and the Villages of Cortland and Maple Park began to transition from rural communities into more suburban communities. This transition from rural to suburban is continuing to occur across the watershed as growth pressure increased from the communities located east and west of the watershed. Without proper planning, the transformation to a more suburban environment the East Branch South Branch Kishwaukee River watershed will begin to experience water quality and habitat degradation.

As of means of protection and improving water quality, the use of stormwater best management practices (BMPs) and the preservation and restoration of the natural drainage system (overland flow paths, streams, and floodplain) should be required in all new development and encourages in areas that have been previously developed. Drainage and detention in existing areas should be retrofitted or repaired to better control runoff rates and volume as well as to improve water quality. Natural and existing drainageways should also be preserved and/or restored to the extent practicable to reduce the impacts of hydrologic modification within the watershed.

All landowners and stakeholders within the watershed have the ability to improve water quality by managing land and property to prevent or remove pollutants in runoff before they are washed into the stream. The implementation of stormwater BMPs is the responsibility of all landowners (for existing development) and developers and builders (for new development). However, municipalities must require or encourage these practices to be installed. Preservation of remaining natural drainage and storage features of the landscape is the responsibility of the private and public land owners. Additionally, the management and maintenance of the stormwater management system (detention basins, storm sewer pipes, drainage swales, etc) is primarily the responsibility of municipalities, unless management of these features has been assumed by a homeowners association or other party.

Programmatic actions aimed at the protection and enhancements of surface and groundwater quality are listed in Table 5-2.

Table 5-2 Water Quality and Groundwater Programmatic Actions

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
1	Watershed-wide	Implement a water quality monitoring program aimed at assessing the current condition of the East Branch of the South Branch of the Kishwaukee River watershed and to assess changes in water quality associated with the implementation of the watershed-based plan.	A1, C1	H	DCWSC	EI, C, MUN	S	n/a	
2	Watershed-wide	Develop a Riparian Landowner Handbook to educate riparian landowners on their responsibilities and easement requirements.	A1, A4, C2	H	DCWSC	SWCD, DCCF	S	$5,000-$20,000	
3	Watershed-wide	Implement a waterside-wide stream maintenance program to remove debris and repair problematic or undersized hydraulic structures.	A1, A2, A4, B2, C1	M	C, DD	USACE, RO	M	$20 per linear foot	
4	Watershed-wide	Update the detailed inventory of all detention and retention basins in the watershed to document storage capacity, vegetation, maintenance needs, etc to identify potential retrofit opportunities.	A1, A2, A3, B4	H	C, MUN	DCWSC, KREP	S	$5,000-$7,000	
5	Watershed-wide	Develop a maintenance plan for all detention and retention basins in the watershed to ensure effective operation and provide maximum detention, water quality benefit, and habitat. The plan should identify who is responsible, a maintenance schedule, budget and funding source.	A1, A2, A3, B4	M	C, MUN	DCWSC, KREP	M	n/a	
6	Watershed-wide	Utilize naturalized detention basins in new development and retrofit existing single function dry bottom detention basins to provide multiple benefits including reducing pollutant loads and proving habitat. Upgrade and maintain existing basins to provide water quality benefits and slower release rates.	A1, A2, A3, A5, B4	M	C, MUN	DCWSC, KREP, DB	M	varies	
7	Watershed-wide	Stabilize eroding shorelines and replace turf pond edges with native vegetation.	A1, A2, A3, C2	L	DD, MUN	RO, CBL	L	$100 per linear foot	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
8	Watershed-wide	Develop stream restoration guidelines to provide guidance to riparian landowners on methods of streambank stabilization, riparian buffer restoration, and other bioengineering techniques.	A1, A2, A4, C2	M	USDA, SWCD	DCSWC	M	$5,000-$20,000	
9	Watershed-wide	Review and updated local landscaping and stormwater requirements to promote the use of native vegetation in water quality BMPs.	A1, A2, A4, C2, D1	H	C	MUN	S	n/a	
10	Watershed-wide	Develop stormwater BMPs for handling residential stormwater including downspouts and sump pumps. Flow should be directed onto a lawn or areas landscaped with native vegetation.	A2, A5, B4	H	C, DCWSC	MUN	S	varies	
11	Watershed-wide	Encourage septic system owners to properly maintain their septic systems. Provide information on routine maintenance evaluations.	A2, A7	H	C	MUN	S	n/a	
12	Watershed-wide	Develop recommendations for outreach regarding the importance of groundwater quality and quantity.	A6, A7	M	DCWSC	DCCF, SWCD, USDA	M	n/a	
13	Watershed-wide	When replacing pavement use pervious or porous pavement or permeable pavers where appropriate to increase infiltration and reduce runoff volumes.	A1, A2, A3, A5, B4	M	KCDOT, DCHD	MUN, TOWN	M	$2 to $6 per square foot	
14	Watershed-wide	Retrofit roadways and parking lots to allow stormwater to enter infiltration BMPs (rain gardens, swales, etc)	A1, A2, A3, A5, B4	L	C	CBL, MUN, TOWN	L	$40-$60 per square yard	
15	Watershed-wide	Where feasible, convert existing swales and open drainageways to infiltration BMPs with native landscaping.	A1, A2, A3, A5, B4	M	DCWSC	C, MUN	M	$40-$60 per square yard	
16	Watershed-wide	Encourage the implementation of stormwater BMPs in new developments and in redevelopment projects above the minimum requirements.	A1, A2, A3, A5, B4	H	C, MUN	DB	S	varies	

Goal B: Reduce existing flood damage in the watershed and prevent flooding from worsening

Objectives

1) Encourage decision makers to undertake a detailed hydraulic and hydrology study of the watershed.
2) Mitigate for existing flood damage by identifying parcels suitable for flood mitigation projects.
3) Reconnect channelized stream segments to the floodplain where feasible.
4) Implement stormwater best management practices (BMPs) throughout the watershed designed to reduce runoff and encourage infiltration.
5) Protect undeveloped floodplain from development.

Flooding and risk of flooding occurs throughout the East Branch of the South Branch of the Kishwaukee River Watershed. The flooding and increased flood risk is primarily a result of historical development within the floodplain, or the construction of restrictive structures that would not meet current hydraulic criteria. However, some flooding may also be related to the changes in land use over time. The changes in land use, particularly prior to countywide stormwater management ordinances, lead to modifications to the floodplain and wetland areas, increased impervious surfaces, and increased rate and volume of stormwater runoff. While the flooding noted in the watershed is not extensive in terms of area affected, the flooding is extremely destructive and disruptive to those suffering from the flood damage. As such, addressing the current and future flood problem areas is important for those affected. Current flooding that occurs in the watershed includes:

- Overbank flooding from a waterway
- Local drainage problems (shallow flooding on roads, yards and sometimes buildings) often due to development in a drainage way, inadequately maintained drainage ditches, undersized storm sewers, and storm sewers.
- Depressional flooding in areas where water ponds in a natural depression in the landscape and there is no natural outlet for runoff. May be caused by failed or sewer or adjacent or surrounding development causing increased runoff into the depressional area.
- Sanitary sewer backups may occur, flooding basements, when stormwater infiltrates into the sanitary sewer pipes, leaky manholes, or inappropriate connections to the sanitary lines.

Increasing drainage capacity for the flooded areas will likely require the installation of new or larger sewer pipes, larger culverts, larger bridges, or improving the capacity of drainageways and ditches. Additionally, the flood storage capacity of the areas could be increased through the construction new detention facilities or the retrofitting of existing facilities to increase storage capacity. Floodproofing options, such as raising structures or the low water entry points above the level of flooding are also available but are not typically preferred solutions as they don’t address the source or cause of flooding.

Programmatic actions aimed at reducing existing flood damage and preventing the flooding from worsening are listed in Table 5-3.

Table 5-3 Flood Mitigation Programmatic Actions

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
3	Watershed-wide	Implement a waterside-wide stream maintenance program to remove debris and repair problematic or undersized hydraulic structures.	A1, A2, A4, B2, C1	M	C, DD	USACE, RO	M	$2 per linear foot per year for maintenance. Hydraulic structures at >$100,000 each	
4	Watershed-wide	Update the detailed inventory of all detention and retention basins in the watershed to document storage capacity, vegetation, maintenance needs, etc to identify potential retrofit opportunities.	A1, A2, A3, B4	H	C, MUN	DCWSC, KREP	S	$5,000-$7,000	
5	Watershed-wide	Develop a maintenance plan for all detention and retention basins in the watershed to ensure effective operation and provide maximum detention, water quality benefit, and habitat. The plan should identify who is responsible, a maintenance schedule, budget and funding source.	A1, A2, A3, B4	M	C, MUN	DCWSC, KREP	M	n/a	
6	Watershed-wide	Utilize naturalized detention basins in new development and retrofit existing single function dry bottom detention basins to provide multiple benefits including reducing pollutant loads and proving habitat. Upgrade and maintain existing basins to provide water quality benefits and slower release rates.	A1, A2, A3, A5, B4	M	C, MUN	DCWSC, KREP, DB	M	varies	
10	Watershed-wide	Develop stormwater BMPs for handling residential stormwater including downspouts and sump pumps. Flow should be directed onto a lawn or areas landscaped with native vegetation.	A2, A5, B4	H	C, DCWSC	MUN	S	varies	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
13	Watershed-wide	When replacing pavement, use pervious or porous pavement or permeable pavers where appropriate to increase infiltration and reduce runoff volumes.	A1, A2, A3, A5, B4	M	KCDOT, DCHD	MUN, TOWN	M	$7 to $12 per square foot	
14	Watershed-wide	Retrofit roadways and parking lots to allow stormwater to enter infiltration BMPs (rain gardens, swales, etc)	A1, A2, A3, A5, B4	L	C	CBL, MUN, TOWN	L	$40-$60 per square yard	
15	Watershed-wide	Where feasible, convert existing swales and open drainageways to infiltration BMPs with native landscaping.	A1, A2, A3, A5, B4	M	DCWSC	C, MUN	M	$40-$60 per square yard	1
16	Watershed-wide	Encourage the implementation of stormwater BMPs in new developments and in redevelopment projects above minimum amount required.	A1, A2, A3, A5, B4	H	C, MUN	DB	S	varies	
17	Watershed-wide	Prepare a detailed H&H model of the watershed to identify all flood problem areas. Cost varies based on level of detail and project deliverables.	B1, B2, B3, B4, B5	H	C, MUN	FEMA, EI	S	$75,000 to $300,000	
18	Watershed-wide	Identify flood mitigation opportunities in the watershed by creatings additional storage and/or maintaining/improving the local drainage through the installation of new or larger sewer pipes, larger culverts, or improving or increasing the capacity of drainageways.	B2, B3, B4, B5	L	CO, MUN	FEMA	L	varies	
19	Watershed-wide	Create/restore wetlands and depressional areas within the watershed	B2, B3	M	SWCD, USDA	RO, DB	M	$10,000 to $60,000 per acre	
20	Watershed-wide	Identify locations where the incised stream channel can be reconnected to the floodplain	B1	L	SWCD, USDA	DCSWC, RO, DB	L	varies	
21	Watershed-wide	Provide information to residents living within and along the 100-year floodplain on the benefits of a functional floodplain.	B5	H	CO, MUN	FEMA, DCWSC	S	n/a	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
22	Watershed-wide	Mitigate flood damages by floodproofing or elevating at-risk structures.	B4	L	CO, MUN	FEMA, CBL, RO		$25 to $75 per sq. ft. of structure	

Goal C: Improve aquatic and wildlife habitat in the East Branch South Branch Kishwaukee River Watershed

Objectives

1) Identify opportunities for improving habitat along degraded stream channels using a natural channel design.
2) Identify opportunities for wetland restoration, creation and preservation within the watershed.
3) Restore riparian buffers along the East Branch South Branch Kishwaukee River and its tributaries.
4) Encourage local residents to utilize native species in their landscapes.
5) Identify opportunities for habitat improvements at parks and natural areas.

Streambank erosion is threatening property, damaging infrastructure, and degrading water quality and riparian habitat. Stabilization, restoration and management of the stream channel, streambank and riparian corridor are needed throughout the watershed to improve water quality, maintain floodplain functions, and improve aquatic and wildlife habitat both within and near the streams. Practices that are needed include restoring instream habitat such as pools and riffles, removing excessive debris from the stream channel, establishing naturalized streambanks with native plants, and managing stream corridors by restoring native riparian buffers.

Through easement agreements, most private landowners are responsible for maintaining the stream and riparian zone as it crosses their property or flows along a property line. This includes all aspects of management and maintenance including debris removal, stabilization of streambanks, and management of private stormwater outfall pipes such as sump pumps and downspouts. Exceptions to the private landowner responsibility exist where the stream flows through publically owned lands such as parks and within right-of-way easements. As problems within the stream and riparian corridor are directly related to land use and other activities upstream in the watershed, it is important that all landowners living within the watershed (not just those living adjacent to the creek) work together on implementing the watershed-based plan.

Programmatic actions for the improvement of aquatic and wildlife habitat are detailed in Table 5-4.

Table 5-4 Programmatic actions for the improvement of aquatic and wildlife habitat

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
2	Watershed-wide	Develop a Riparian Landowner Handbook to educate riparian landowners on their responsibilities and easement requirements.	A1, A4, C2	H	DCWSC	DCCF, SWCD	S	$5,000-$20,000	
3	Watershed-wide	Implement a waterside-wide stream maintenance program to remove debris and repair problem hydraulic structures.	A1, A2, A4, B2, C1	M	C, DD	USACE, RO	M	$20 per linear foot	Watershed-wide
7	Watershed-wide	Stabilize eroding shorelines and replace riprap, concrete and turf pond edges with native vegetation.	A1, A2, A3, C2	M	DD, MUN	RO, CBL	M	$100 per linear foot	
8	Watershed-wide	Develop stream restoration guidelines to provide guidance to riparian landowners on methods of streambank stabilization, riparian buffer restoration, and other bioengineering techniques.	A1, A2, A4, C2	M	USDA, SWCD	DCSWC	M	$5,000-$20,000	
9	Watershed-wide	Review and updated local landscaping and stormwater requirements to promote the use of native vegetation in water quality BMPs.	A1, A2, A4, C2, D1	H	C	MUN	S	n/a	
23	Watershed-wide	Use bioengineering techniques in sections of hierologically modified channel to improve instream and streamside habitat.	C1,C 2	M	RO	USACE, SWCD, USDA	M	$50-$150 per linear foot	
24	Watershed-wide	Restore instream and riparian habitat in conjunction with road and bridge improvement projects.	C1,C2	M	KCDOT, DCHD		M	Varies	
25	Watershed-wide	Provide information to residents and business owners on the benefits of native landscaping.	C3	H	DCWSC	SWCD, KREP	S	n/a	
26	Watershed-wide	Promote native plant and native seed exchanges and/or sales.	C3	H	DCWSC	SWCD, KREP	S	n/a	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
27	Watershed-wide	Where feasible, daylight and re-meander streams that have been contained in ditches or moved underground into culverts and pipes.	C1, C2	L	C, DD, SWCD	RO	L	$575 per linear foot	
28	Watershed-wide	For moderately and severely eroded stream reaches, develop a stream restoration plan and cost estimate.	C1	M	SWCD, DD	C, MUN, USACE	M	varies	
29	Watershed-wide	Establish native riparian buffers along all unbuffered or inadequately buffered stream reaches.	C2, C3, D1, D2	H	SWCD, DD	NRCS, RO	S	$12-$25 per linear foot	
30	Watershed-wide	Restore streams and aquatic habitat to a health stream condition by installing habitat features such as natural channel substrates and pools and riffles.	C1	L	DCWSC, SWCD	KREP, RO, USDA	L	$250-$500 per linear foot	
31	Watershed-wide	Prepare a Natural Areas Management Plan for all public lands in the watershed as a means of identifying opportunities for habitat improvement projects.	C4, D1, D2	M	C	MUN	M	$5,000-$20,000	
32	Watershed-wide	Prevent the spread and control existing populations of invasive plant species.	C4, D2	M	KREP, SWCD	C, DD, MUN, RO	M	varies	

Goal D: Develop open space in the East Branch South Branch Kishwaukee River Watershed and provide recreational opportunities

Objectives

1) Identify open space along the waterways that would provide access to the waterway.
2) Identify open space aimed at protecting and preserving natural resources
3) Identify areas that can be used for multiple uses (trails, passive recreations)
4) Support DeKalb and Kane Counties' Future Land Use Plans which promote conservation and open space corridors
5) Encourage private landowners to install filter strips or riparian buffers along stream corridors

There are approximately 1,542 acres (1.96% of the watershed) of open space, parks, and forest preserves in the watershed. Open space and natural areas such as stream and riparian corridors, wetlands, and parks that remain undeveloped provide storm and flood water protection, serve as natural buffers for streams, and serve as passive and active recreational spaces for residents and visitors to the watershed. As such it is important for the watershed-based plan to identify ways of restoring/creating naturalized open space and improving access to creeks for recreational activities.

Programmatic actions for the development of open space and recreational opportunities are presented in Table 5-5.

Table 5-5 Programmatic actions for the development of open space and recreational opportunities

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
29	Watershed-wide	Establish native riparian buffers along all unbuffered or inadequately buffered stream reaches.	C2, C3, D1, D2	H	SWCD, DD	NRCS, RO	S	$12-$25 per linear foot	
31	Watershed-wide	Prepare a Natural Areas Management Plan for all public lands in the watershed as a means of identifying opportunities for habitat improvement projects.	C4, D1, D2	M	C	MUN	M	$5,000-$20,000	
32	Watershed-wide	Prevent the spread and control existing populations of invasive plant species.	C4, D2	M	KREP, SWCD	C, DD, MUN, RO	M	varies	
33	Watershed-wide	Form partnerships to develop grant applications for the protection of open space and the expansion of trails and greenways.	D1, D2	H	DCSWC, DCCF	PD, DCFP, FPDKC	S	n/a	
34	Watershed-wide	Identify opportunities for municipalities to encourage the use of green infrastructure and open space preservation in new developments.	D1, D2	H	MUN	C	S	n/a	
35	Watershed-wide	Encourage all municipalities in DeKalb County to incorporate the recommendation of the DeKalb County Greenways and Trail Plan into their comprehensive plan.	D2	H	C	DCCF, MUN	S	n/a	

Goal E: Increase coordination between decision makers and other stakeholders in the Watershed.

Objectives

1) Encourage communities to adopt the East Branch South Branch Kishwaukee River Watershed-Based Plan.
2) Encourage the adoption and/or revision of comprehensive plans and ordinances that support the watershed plan's goals and objectives.
3) Encourage communities to continue to be an active member of the Watershed Steering Committee following plan development.

Due to the nature of the watershed, activities in one area of the watershed can impact water resources in another part of the watershed even when those areas seem distant and unconnected. And subsequently, the actions of all those living within the watershed have impacts, whether negative or positive, on the health of East Branch of the South Branch of the Kishwaukee River and its tributaries. As such, the participation and coordination of all watershed stakeholders is necessary for water quality and habitat improvements and flood reduction in the watershed. No single person, municipality or entity can effectively implement the watershed-based plan alone.

Many of the recommendations in the plan require technical expertise and require significant funding to implement. As such, coordination across property and jurisdictional lines is vital for the successful implementation of the plan. By working together, stakeholders can share expertise and equipment making projects that one entity could not do alone feasible. Additionally, available monies can be combined and leveraged for maximum benefits.

Programmatic actions for the development of coordination between decision makers and watershed stakeholders are presented in Table 5-6.

Table 5-6 Programmatic actions for the development of coordination between decision makers and watershed stakeholders

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
36	Watershed-wide	Encourage the adoption of the Watershed-Based Plan by all jurisdictions located in the watershed.	E1, E2	H	C	DCWSC, MUN	S	n/a	
37	Watershed-wide	Continue to meet as the Watershed Steering Committee in order to facilitate plan implementation and conduct progress evaluations.	E1, E3	H	DCWSC	C, DD, MUN	S	n/a	
38	Watershed-wide	Members of the Watershed Steering Committee should work together to prepare grant applications and develop funding packages for the implementation of the plan's recommendations.	E3	H	DCWSC	DDCF	S	n/a	
39	Watershed-wide	Incorporate the watershed-based plan's goals, objectives, and recommendations in to municipal codes, regulations and comprehensive plans.	E1, E2, E3	H	C, MUN		S	n/a	
40	Watershed-wide	Hire a watershed coordinator to assist the Watershed Steering Committee with plan implementation.	E3	M	DCWSC	C, DCCF, MUN	M	$12,000	
41	Watershed-wide	Provide training and educational outreach to municipal officials and engineers on the goals, objectives, recommendations, and implementation of the watershed-based plan.	E1, E2	H	DCWSC	DCCF	S	n/a	

Goal F: Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

Objectives

1) Provide watershed stakeholders with an outreach plan that gives them the skills needed to implement the watershed plan.
2) Develop an urban outreach program for communities that will focus on stormwater management. This may include rain gardens, bioswales, and rainwater capturing.
3) Promote conservation programs for the agricultural community including providing meetings and tours to showcase BMPs.
4) Introduce new concepts into agriculture such as "nutrient farming" or as sometime referred to as "pay for environmental services" programs.

Even the best plan for managing watersheds and controlling nonpoint source pollution cannot succeed without community participation and cooperation. An aggressive public outreach and education program, therefore, is essential and must be nurtured. Because many water quality problems result from individual actions and the solutions are often voluntary practices, effective public involvement and participation to promote the adoption of management practices is necessary. The needed public buy-in and support is impossible unless stakeholders understand their role in watershed protection and restoration and are willing to make changes in their behavior that will help achieve overall watershed goals. A well designed and implemented education and outreach plan is necessary to facilitate changes in stakeholders' opinions and actions.

Programmatic actions for education and outreach are presented in Table 5-7.

Table 5-7 Programmatic actions for education and outreach

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
42	Watershed-wide	Provide training and educational outreach to municipal officials and engineers on the goals, objectives, recommendations, and implementation of the watershed-based plan.	E1, E2, F3	H	DCWSC, DCCF	C, MUN, SWCD	S	n/a	
43	Watershed-wide	Offer workshops to homeowners on native landscaping and other stormwater BMPs.	F2, F3	M	DCWSC, DCCF	KREP, SWCD	M	n/a	
44	Watershed-wide	Encourage interested watershed residents to join the Kishwaukee Ecosystem Partnership.	F1	M	KREP		M	n/a	
45	Watershed-wide	Maintain the watershed planning website to keep the public informed on plan implementation activities.	F2, F3	H	DCWSC, DCCF	C	S	n/a	
46	Watershed-wide	Hold watershed workshops in parks and other open spaces.	F2, F3	M	DCWSC, DCCF	KREP, SWCD	M	n/a	
47	Watershed-wide	Educate riparian property owners on ways to improve riparian conditions for water quality and habitat.	F3	H	DCWSC, DCCF	SWCD	S	n/a	
48	Watershed-wide	Educate homeowners associations, developers, and municipalities about the importance of protecting open space, incorporating stormwater BMPs, and maintenance strategies for existing BMPs.	F2, F3	H	DCWSC, DCCF	DB	S	n/a	
49	Watersged-wide	Install signs at major brodge crossings that include the name of the creek and the watershed.	F2	H	DCWSC	DPT	S	$100-200 per sign	

Section 5.3.2 Regulatory Ordinance Review and Recommendations

Stormwater and floodplain management regulations govern allowable development practices and the required stormwater management controls to prevent future water quality degradation and future flood damages. Since much the watershed is undeveloped, development regulations will play a major role in protecting the watershed going forward. The need for this review of current regulations and recommendations for enhancing these regulations was identified by stakeholders as an important element of the watershed plan.

All of the watershed is regulated by State of Illinois rules and regulations, some of which have become increasingly restrictive and more protective of water quality in the last few years. Stormwater discharges from construction sites are regulated by General NPDES Permit No. ILR10 (current rules became effective 8-1-13). Municipal Separate Storm Sewer Systems (MS4s), are regulated by General NPDES Permit No. ILR40 (expired 03-31-14, expected to be reissued soon). There are also many other state and federal permits that apply to projects with certain types of impacts, but ILR10 and ILR40 are the two of the most broadly reaching, respectively applying to every project that disturbs more than one acre, and every community that operates storm sewers.

Both DeKalb County and Kane County have implemented countywide regulations that set minimum standards for stormwater and floodplain management. Communities may adopt these ordinances with additional restrictions. Based on a review of local ordinances, it was not evident that any communities have adopted amendments to the county ordinances that included significantly more restrictive stormwater regulations. Therefore, this review focuses on regulations that have been established at the county level by both DeKalb and Kane Counties.

Stormwater performance standards that protect the waterways can generally be classified in six categories.

1. Drainage and Detention
2. Soil Erosion and Sediment Control
3. Water Quality
4. Riparian Buffers
5. Wetlands
6. Floodplain Management

For each of these categories, summaries of the current regulations and recommendations potential enhancements are provided below. However, the first summary section includes the definition of regulated development. The definition of regulated development is critical because it determines when and how the performance standards apply.

Regulated Development – The definition of a regulated development identifies what activities are subject to regulation. For DeKalb County, regulated development is identified as a list of activities in Section 7.1 of the ordinance. DeKalb County has a comprehensive list of regulated activities and is possibly one of the most inclusive lists in Illinois. It includes all development that disturbs over 10,000 sq. ft., any construction within 100 feet of a waterway, lake or wetland; and all construction within the Special Flood Hazard Area. While certain agricultural activities involving under one acre are exempted, other development activities on agricultural land are subject to the ordinance. Also notable is that new residential developments with unincorporated DeKalb county are not allowed, so these types of development will always fall under the jurisdication of a municipality.

Kane County also includes a comprehensive list of "development" activities. While the definition of development determines which types of projects area subject to the ordinance, there is a secondary list in Section 200 (b) that defines which developments must provide detention. Non-residential properties must be at least one acre in size and new residential developments must be at least three acres in size with two or more homes in order for detention storage to be required. Redevelopment projects that impact at least 25,000 square feet are also required to provide detention storage. The minimum development sizes for requiring detention are similar to some nearby counties and less restrictive than others. Kane County should evaluate and consider the potential benefits and impacts of lowering the minimum development size for requiring detention.

Drainage and Detention – In DeKalb County, the required release rate is 0.2 cfs per acre for the 100-year event, unless a development is within 1.5 miles of a municipality in which case it is 0.15 cfs per acre or the adopted release rate (if more restrictive) of that community. In practice, the application of this dual release rate system would have little noticeable effect on the future flooding conditions of a community. Both release rates are much less than an undetained development and it is unlikely that the incremental difference between the two rates (0.05 cfs per acre) is significant enough to be noticeable for a subset of developments within the context of a large watershed. This rule does have the beneficial practical effect of preventing developments from "ringing" a municipality to avoid potentially more stringent release rates. However, the limitations placed on residential development within unincorporated areas also serve this purpose.

In DeKalb County, The peak release rate for the 2-year event and lesser storms is required to be less than pre-development conditions. In practice, this is a challenging requirement to enforce because it hinges on an existing conditions release rate computation that must be submitted by the developer. Standardizing the regulation of the 2-year event should be considered by adopting a constant release rate.

DeKalb County requires maintenance plans for the both the short and long term maintenance of stormwater facilities. If maintenance is to be conducted by a property owners' association, the ordinance acknowledges that the developer must inform them of their responsibility. Experience in other counties has shown that without strong provisions requiring stormwater maintenance, many stormwater features fall into disrepair as associations end up not conducting the appropriate preventative maintenance and then lack the funds to implement major repairs. Future development may lead many more stormwater management features in the county. One consideration could be to include a requirement provisions for financing necessary maintenance be included in deed restrictions or other contractual agreements. In Kane County, the maintenance requirements are similar, but in the absence of a public entity taking responsibility for maintenance, then a special service area is required as a primary or secondary vehicle for collecting funds that are dedicated to maintenance.

Kane County requires that the release for developments required to provide detention be 0.1 cfs per acre for the 100-year storm. It has been found that this release rate also provides control of smaller storm peaks, such as the 2-year storm.

Both counties require the preservation or replacement of any depressional storage volume that is present under predevelopment conditions.

Soil Erosion and Sediment Control – Both county ordinances include requirements for soil erosion and sediment control measures. In addition, all areas of the watershed are protected by ILR10, which when properly followed and enforced provides adequate protection to the watershed from soil erosion and sedimentation.

Water Quality – The capture, reduction and treatment of runoff through green infrastructure and stormwater best management practices are well proven methods for improving the water quality of stormwater from developed areas.

The DeKalb County stormwater ordinance references a runoff reduction hierarchy, but as in many other counties, this provision lacks clarity or detail needed for effective enforcement of this rule. Other counties are moving toward volume control or performance based regulations that specify how the development must reduce volume of runoff leaving the site. There is a growing variety of methods for implementing this type of regulation. Regulations from nearby counties such as McHenry, Lake, DuPage and Cook should be reviewed to determine if any of these approaches to this issue would be an acceptable starting point in DeKalb County.

Kane County requires that the runoff from a 0.75 inch rainfall event over the hydraulically connected impervious area of the new development be stored below the elevation of the primary gravity outlet (retention) of the site runoff storage facility. This provision provides incentive to disconnect and reduce impervious areas and provides additional credit for not disturbing soils and installing deep rooted vegetation. The intent of this requirement is to enhance the water quality of stormwater that is discharged from detention basins. In light of the expanding range of green infrastructure techniques that have evolved over the last decade, an ordinance amendment (Article 16) was adopted to provide additional guidance and flexibility in meeting the retention standard. Article 16 provides guidance on a number of retention based stormwater BMPs that can be used to meet the Kane County 0.75-inch retention standard. This expanded range of practices has enhanced the ability of designers to implement and receive credit for various water quality, stormwater BMPs and green infrastructure solutions.

Riparian Buffers – Healthy Riparian environments reduce flood flow rates and volumes, help to stabilize banks, reduce pollutants and sediment that enter waterways, and provide wildlife habitat. Effective regulation of riparian buffers will protect and enhance the waterways in the watershed.

In DeKalb County, all areas of floodplain are zoned as a floodplain/conservation district (FP/C). Development is restricted within FP/C to a list of restricted uses that generally involve open space and passive recreation. While buffer is defined, there are no requirements for riparian buffers. The county should consider the benefits of including requirements for riparian buffers.

Kane County regulates linear buffers along waters of the U.S. and jurisdictional and isolated wetlands associated with water courses. The buffer requirement is 50 feet for lineal waters of the U.S. that have a drainage area greater than 640 acres or that are designated as high habitat or high functional value by the Advanced Identification of Aquatic Resources (ADID) study, or have an adjacent wetland with a calculated Floristic Quality Index (FQI) greater than 16. For lineal waters of the U.S. with less than 640 tributary acres, the buffer width varies based on the upstream area.

Wetlands – DeKalb County requires that all development within 100 feet of a wetland be permitted under the stormwater management ordinance. A buffer width of 25 feet is required around all existing wetlands. There are no other provisions that are more protective than the U.S. Army Corps of Engineers (ACOE) Section 404 rules. Additional rules to define and protect isolated wetlands should be considered.

Kane County regulates isolated wetlands that are not regulated by the ACOE when the minimum impact is greater than or equal to 0.10 acre. There are no minimum impact requirements and mitigation requirements are based on the quality of the wetland. Required Buffer widths can vary from 15 to 50 feet around wetlands dependent on size and quality.

Floodplain Management – Both counties participate in the National Flood Insurance Program. Both counties restrict filling of the floodplain and require compensatory storage for any proposed filling. In DeKalb County, all areas of floodplain are zoned as a floodplain/conservation district (FP/C). Development is restricted within FP/C to a list of restricted uses that generally involve open space and passive recreation. The flood protection elevation (a requirement that structure be elevated above the floodplain) has been defined as 2 feet in both DeKalb and Kane Counties (Kane County has a higher FPE of 3 feet along the Fox River).

Section 5.4 Site Specific Action Plan

In addition to the programmatic recommendations, which generally apply watershed wide, site specific action items and recommendations are tied to a particular location in the watershed. As with the programmatic actions, these site specific recommendations were developed to address watershed problems, to improve watershed resources, and to achieve the watershed goals and objectives.

The process of identifying specific sites that are in need of, or suited to, watershed improvement projects has been ongoing during the planning process and will continue throughout plan implementation. Watershed improvement projects in the site specific plan range from small maintenance and repair tasks, to mid-size projects such as detention basin retrofits to the construction of large regional storage facilities.

During development of the watershed-based plan, several methods were used to identify project sites.

1) Members of the DCWSC provided site and project recommendations during meetings.
2) Watershed stakeholders provided site and project recommendations during public meetings.
3) New data was collected and project opportunities were identified during the field assessments conducted as part of the watershed planning process.
4) Extensive map analysis using existing data including land use, wetlands, soil, floodplain, etc. was used to identify locations where beneficial projects could be implemented.

The Site Specific Plan is summarized in table format (Table 5-8). The table includes the recommended BMP, priority, cost, responsible lead agencies or organization with greatest potential to implement the recommendation, and support agencies or agencies who could assist with technical, financial, or regulatory assistance or whose programs may be impacted by the recommendations. Each recommendation is given a BMP ID number (ID#). Following the summary table, Sections 5.4.1 through 5.4.7 provide greater detail on the site specific recommendations.

The provided cost estimates are included for advisory purposes only. The cost estimates should not be interpreted as concept costs and are best used to compare the relative costs of the recommended BMPs. More detailed costs can be developed once site constraints and additional conceptual or preliminary engineering activities are conducted. Funding for these projects will likely come from state and federal grants and local sources. See Chapter 6.0 for additional information on potential funding sources.

Each of the BMPs was assigned a priority status and classified as high (H), medium (M), or low (L). Priority status was assigned based on need, cost, potential funding opportunities, and technical needs. High priority action items should be considered short-term goals (1-5 years) while medium and low priority action items are considered long-term goals (greater than 5 years).

Figure 5-1 shows the location of the Site Specific Projects.

Table 5-8 East Branch South Branch Kishwaukee River Watershed Site Specific Action Plan

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
East Branch South Branch Kishwaukee Subwatershed									
50	at Martin's Ditch	1.5 miles	Stabilize streambanks to reduce the potential for flooding, reduce infrastructure loss and damage, and reduce sediment and pollution loads.	L	Sycamore	DeKalb County	L	Initial Study $25,000; project components starting at $250,000 and potentially ranging up to $4M (longterm)	
51	at B&O Auto Yard	6.8 acres	Install infiltration-based BMPs (rain gardens, bioswales, etc) to capture, store, and remove pollutants from site operations prior to discharging into the East Branch South Branch Kishwaukee River. Develop a Pollution Prevention Plan for site operations.	M	CBL	DeKalb County	M	$50,000 to $500,000	
52	at DeKalb County Government Center	TBD	Install infiltration-based BMPs (permeable pavers/pavement, bioretention basins) in planned parking lot expansion.	H	DeKalb County		S	$15-$50 per square foot (bioinfiltration)	
53	at Evergreen Mobile Home Park	20 acres	Support DeKalb County initiative to remove structures from the floodplain.	H	DeKalb County		S	$1,500,000	
54	South of Elm Street and north of	4.2 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff	L	DCWSC	Sycamore	L	$15-$50 per square foot (bioinfiltration)	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
55	at Sycamore Wastewater Treatment Plan	TBD	Explore the feasibility of the construction of a post-treatment polishing wetlands in conjunction with any future plant expansion	L	Sycamore		L	$75,000-$100,000	
56	Parkside Preserve and adjacent 80 acres	80 acres	Stabilize and restore streambanks. Investigate the feasibility of utilizing the site for wetland creation.	H	Sycamore Park District		S	$50-$150 per foot of streambank stabilization and $25,000 to $75,000 per acre of wetland creation	
57	Blue Heron Creek	5.8 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	M	DCWSC, RO	DD, RO	M	$75-200 per foot of active work areas	
58	E Branch S Branch Kishwaukee River just north of Bethany Road and Fenstemaker Road	1.7 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species. Investigate the feasibility of river restoration to reduce poor hydraulic performance.	M	DD, RO	USDA, SWCD	M	$75-200 per foot of active work areas	
59	E Branch S Branch Kishwaukee River near Peace Road	2.0 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	H	DD, RO	USDA, SWCD	S	$75-200 per foot of active work areas	
Union Ditch Subwatershed									
60	At Fulton Drive	4.1 acres	Retrofit existing turf grass detention basin for increased filtering/pollutant removal.	L	DB; DCWSC	Maple Park	L	$10,000 to 25,000 per acre	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
61	At Union Ditch #2 and County Line Road	0.2 acres	Install an infiltration –based BMP to capture, store, and treat road runoff prior to discharge into Union Ditch #2.	M	DeKalb County	Maple Park	M	$15-$50 per square foot (bioinfiltration)	
62	East of County Line Road between Willow Road and Washington Road	0.66 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff.	M	DCWSC	Maple Park	M	$15-$50 per square foot (bioinfiltration)	
63	West of Somonauk Road between Carol Avenue and North Avenue	0.95 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff.	M	DCWSC	Cortland	M	$15-$50 per square foot (bioinfiltration)	
64	East of Somonauk Road between Constoga Avenue and Maple Avenue	0.76 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff.	L	DCWSC	Cortland	L	$15-$50 per square foot (bioinfiltration)	
65	at Maple Park Wastewater Treatment Plan	TBA	Explore the feasibility of the construction of a post-treatment polishing wetlands in conjunction with any future plant expansion	L	Maple Park		L	$75,000-$100,000	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
66	at Virgil Forest Preserve	1, 124 acres	Remove trees along drainage ditches, create a 100-150' buffer along the edges and plant with deep rooted native species to stabilize erosion areas along ditch banks.	H	FPDKC		S	$150,000	
67	at Virgil Forest Preserve	1, 124 acres	Map existing drain tile and work with the Village of Virgil and adjacent property owners to isolate groundwater drainage, from surface drainage or other systems connected to the groundwater drainage system.	M	FPDKC		M	$200,000	
68	at Virgil Forest Preserve	1, 124 acres	Install water level control structures and drain tile improvements to allow water level management for wetland creation and flood management.	L	FPDKC		L	$150,000	
69	Union Ditch #32– Maple Park Branch	2.5 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	M	DD, RO	USDA, SWCD	M	$75-200 per foot of active work areas	
70	Union Ditch south of Sycamore to the Union DD	1.9 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	M	DD, RO	USDA, SWCD	M	$75-200 per foot of active work areas	
71	Virgil Ditch #1 West limits of Virgil #1 DD	2.3 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species. Expand Drainage District limits to include area.	H	DD, RO	USDA, SWCD	S	$75-200 per foot of active work areas	
72	Headwaters of Virgil #1	N/A	Develop a Digital Terrain Model and/or detailed hydrologic and hydraulic study utilized to locate, prioritize, and design stormwater BMPs.	L	Kane County, Elburn		L	$15,000	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
Virgil Ditch Subwatershed									
66	at Virgil Forest Preserve	1,124 acres	Remove trees along drainage ditches, create a 100-150' buffer along the edges and plant with deep rooted native species to stabilize erosion areas along ditch banks.	H	FPDKC		S	$150,000	
67	at Virgil Forest Preserve	1, 124 acres	Map existing drain tile and work with the Village of Virgil and adjacent property owners to isolate groundwater drainage, from surface drainage or other systems connected to the groundwater drainage system.	M	FPDKC		M	$200,000	
68	at Virgil Forest Preserve	1, 124 acres	Install water level control structures and drain tile improvements to allow water level management for wetland creation and flood management.	L	FPDKC		L	$150,000	
73	Virgil Ditch #3 from Winters Road to Route 64	1.9 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	H	DD, RO	USDA, SWCD	S	$75-200 per foot of active work areas	

5.4.1 Stream Corridor Restoration Projects

BMP ID#50: Martin's Ditch Streambank Stabilization

Martin's Ditch is an urban ditch that drains the central portion of the City of Sycamore. Martin's Ditch originates at the outfall of the stormwater retention basin located south of the intersection of Borden Road and Prairie Drive. From this point, it flows north into another storage basin and then through a residential area, eventually crossing under DeKalb Avenue and IL 64. North of IL 64, Martin's Ditch flows under Cross Street and continues in a northwesterly direction to its confluence with the East Branch South Branch Kishwaukee River near the City of Sycamore Waste Water Treatment Plant.

Martin's ditch is severely confined with residential properties (primarily constructed in the early 20th century) lining its banks for much of its length. Driveways, lawns, residential structures and out buildings are frequently located within 10 feet of the top of bank. The waterway is confined to a very narrow corridor with no buffer along almost its entire length. There are some areas that appear to be in reasonably stable condition without bank protection. There are also many isolated locations where rock, walls, or concrete has been used to stabilize the bank. Finally, there are exposed soil streambanks evident, but these areas likely don't experience severe rates of erosion because the ditch continues to be highly confined. With a highly confined waterway located so close to residential properties, it is likely that some adjacent land owners have replenished or rebuilt streambanks or installed armoring to prevent property loss. However, recent or direct evidence of this occurring was not discovered.

The large detention basins at the upstream end of Martin's Ditch are likely serving to prevent severe flooding of the properties that so closely line the waterway. The primary concern for Martin's Ditch is that all urban runoff from adjacent streets, yards, driveways is discharged directly into the waterway with no opportunity for infiltration, filtering or treatment. Streams that area so close to residential properties also seem to frequently be used for illicit dumping of yard waste or other unwanted items or chemicals. Achieving some separation from adjacent properties would improve the health of Martin's Ditch and reduce pollution discharged from this waterway.

A corridor study should be conducted to determine if a corridor could be reestablished along the ditch to create some buffer from adjacent properties and streets. If properties fall into disrepair or foreclosure, there may be opportunities to assemble properties for a future open space corridor, there also appear to be several unimproved lots along the ditch that may also offer opportunities to restore a stream corridor. Exposed banks could be repaired and stabilized and a buffer area could be established along the waterway. Other communities have successfully implemented programs where they opportunistically acquired properties over time and were eventually able construct an open space stream corridor where properties formerly lined the waterway as with Martin's Ditch. The main water quality benefit associated with the Martin's Ditch streambank stabilization is the reduction of urban non-point source pollutants. Additional benefits include the creation of wildlife habitat, reduce damage to infrastructure, and reduced localized flooding.

BMP ID#56: Parkside Preserve and adjacent lands

The East Branch South Branch Kishwaukee River flows in a northerly direction through lands owned by the Sycamore Park District east of Bethany Road near Quigley Road. Parkside Preserve is situated on the west side of the river and is approximately 30 acres in size. The Sycamore Park District has also acquired 80 acres on the east side of the East Branch South Branch Kishwaukee River. Bank erosion is prevalent along both banks of the East Branch South Branch Kishwaukee River though the Sycamore Park District property. Soft-stabilization measures such as grading to eliminate steep slopes and scour areas, with the subsequent planting of native vegetation, and bioengineering practices should be utilized to stabilize the eroding streambanks. The main water quality benefit associated with the streambank stabilization along the East Branch South Branch Kishwaukee River is the reduction of non-point source pollutants including sediment generated from erosion and in-stream sediment movement. Additional benefits include the creation of wildlife habitat.

BMPID#58: E Branch S Branch Kishwaukee River just north of Bethany Road and Fenstemaker Road

Based upon a review of historic maps, it appears that the existing channel in this location has been straightened and channelized for over 100 years. In its present condition, this reach of the South Branch of the Kishwaukee River provides little to no water quality and wildlife habitat benefits to the watershed other than flood conveyance. Two concepts for enhancing this reach that will provide multiple benefits including water quality enhancement, in-stream habitat, wetland habitat, aesthetic beautification, and potential passive recreation opportunities are described below.

Restoration

The term restoration, as used here, refers to re-establishing historic conditions including channel alignment, meanders, and wetlands to the extent practical. Historic maps, aerial photos, and other resources would be used to guide the design of the re-creation of the historic channel and wetlands. Current hydrology and hydraulics would also have to be considered to ensure there are no adverse flooding impacts, and so that the wetland functions as intended. Re-creation of historic conditions would be achieved primarily through earthwork to re-align the channel to add meanders, re-connect the channel to its floodplain, and to create in-stream hydrodynamic variability through the creation of pools and riffles. Streamside and wetland vegetation would also need to be carefully designed and planted to establish desirable habitats.

Enhancement

The second option for the subject reach would involve leaving the channel in its current location for the most part. Careful planned and executed earthwork would reconnect the channel to wetlands created/restored within the floodplain. Some in-stream work – such as the creation of pools and riffles – could also be accomplished to provide additional water quality and aquatic habitat benefits. Streamside and wetlands vegetation would also need to be thoughtfully designed and planted to achieve the desired goals.

5.4.2 Digital Terrain Modeling and/or Hydraulic and Hydrologic Study

BMP ID#72: Headwaters of Virgil Ditch #1

The headwaters of the Virgil Ditch #1 originate in the northwest quadrant of the Village of Elburn. In the early 2000s, this headwater area has been experiencing commercial and residential development that appears to be altering the flow characteristics of Virgil Ditch #2 downstream of the development. It is recommended that a Digital Terrain Model (DTM) grid be developed to assist with the creation of a flowpath diagram for the subject area. The flowpath diagram represents an idealized representation of how water would flow along the ground surface assuming that all the sewers are full and all lakes, depressional areas and other low-lying areas are full of water. This flowpath diagram can highlight potential project sites by looking for flowpath junctions at problem areas to determine if there is a significant upstream tributary area that could justify the project location.

In addition, a detailed hydrologic and hydraulic study of the subject area could be conducted. This study would take into consideration the current land use, storm sewers, open channels, detention / retention basins and overland flow paths. This study could then be utilized to locate, prioritize, and design improvement projects.

5.4.3 Stream Corridor Management Programs

BMP ID#57, 58, 59, 69, 70, 71, and 73– Various Watershed Locations

Numerous locations in the watershed have been identified as being prone to woody debris jams. Many different types of woody debris can be found in a stream ranging in size from small to large. Small floating debris such as sticks and small limbs may form minor, temporary jams that are easily swept downstream during higher flows. There are usually no significant maintenance problems associated with this small floating debris. Medium floating debris consists of larger tree limbs and sticks introduced into the stream by bank erosion, wind, or the natural shedding of riparian trees and other vegetation. This type of debris could present a maintenance problem if it accumulates at culvert or bridge structures. Large woody debris consists of one to several “key” logs, four inches or more in diameter and at least six feet long, which act as a base on which other stream-borne debris accumulates. Large woody debris (LWD) may include intact branches and may be above or below the water surface or partially submerged. Both medium and LWD present a problem in the East Branch South Branch Kishwaukee River Watershed.

Any medium debris accumulated at culverts and bridge structures should be removed as it can restrict stream flow and cause localized flooding. The presence of LWD is a bit more challenging to handle as it presence can be beneficial or hazardous to the stream and surrounding lands depending on where it is located. Recognizing how LWD is organized in a stream, and how each component functions, is necessary before deciding how and when to remove or modify the structure. A Stream Corridor Management Program should be developed for each of the noted problem areas to provide land owners and municipalities the information needed to assess LWD structures and make decisions about their removal or management.

The Stream Corridor Management Plans should include the following six sections:

1. A discussion on the physical properties (flow characteristics, erosion, sedimentation, etc) of LWD structures including their hazards and benefits.

2. A toolbox of appropriate measures (removal, trimming, anchoring, etc) for remediating hazard LWD structures in the watershed.
3. A methodology (field inspection checklist) for assessing LWD in the watershed.
4. A Field Inventory of all LWD structures with the identified stream reach.
5. A Maintenance/Removal Plan for all hazard LWD structures found within the assessed stream reach.
6. A reference list that includes applicable permits that may be required when dealing with LWD and funding sources and technical resource professionals that may be able to assist with LWD maintenance projects.

5.4.4 Wetland Creation/Restoration and Native Landscaping Restoration

Project #66, 67, and 68 – Virgil Forest Preserve

The Forest Preserve District of Kane County (FPDKC) owns the 1,124-acre Virgil Forest Preserve which is location near the Village of Virgil in the Virgil Ditch and Union Ditch subwatersheds. This expansive preserve was created in 2006 by eight different land acquisitions. Although the fields are currently in cultivation, management plans for the area include large-scale restoration of woodlands and prairies. Using maps from the 1830s, the KCFPD plans to recreate the meandering streams and wetlands that were channelized during the height of agricultural development.

The East Branch South Branch Kishwaukee River Watershed Plan recommends three projects that will assist the FPDKC of completing its vision for the Virgil Forest Preserve:

1. Remove trees along drainage ditches, create a 100-150' buffer along the edges and plant with deep rooted native species to stabilize erosion areas along ditch banks;
2. Map existing drain tile and work with the Village of Virgil and adjacent property owners to isolate groundwater drainage, from surface drainage or other systems connected to the groundwater drainage system; and
3. Install water level control structures and drain tile improvements to allow water level management for wetland creation and flood management.

5.4.5 Urban Projects

Projects #52, 54, 61, 62, 63, and 64 – Infiltration BMPs

Proposed infiltration-based projects such as rain gardens, bioswales, and bioinfiltration basins are proposed for the East Branch South Branch Kishwaukee River Watershed. The main functions of the infiltration-based BMPs are to reduce the velocity of storm water flow and runoff and to provide a water quality filtration device. Infiltration-based BMPs can also create an aesthetically pleasing green space for nearby residents and recreational users.

Implementation consists of removing existing vegetation along with grading the project area to the proper size and slope. An appropriate native seed mix is then spread on the area and perennial vegetation can also be planted. If desired, wetland vegetation can be used on the bottom of the BMP if standing water is expected. Directing water to the infiltration-based BMP is accomplished by grading the surrounding area so that it slopes to the BMP, or incorporating curb cuts into the adjacent street so water flows into the BMP rather than into curb inlets. If installed correctly and maintained over time, infiltration-based BMPs can be an effective best management practice to manage stormwater.

BMP ID#61 is the construction of an infiltration-based BMP on the southeast corner of County Line Road and Union Ditch #2. In its present configuration, drainage from County Line Road is directed via a concrete-lined channel to a catch basin that drains directly to Union Ditch #2. The removal of the concrete-lined channel and the construction of an infiltration-based BMP with native vegetation would provide water quality treatment such as sediment, nutrient, and heavy metal reduction to runoff generated from County Line Road.

There are several areas within incorporated Cortland, Maple Park, and Sycamore that were constructed without detentions (BMP ID#54, 62, 63, and 64. These areas have roadside swales that collect and transport stormwater from the houses, driveways, and roads to the storm sewer system. From the storm sewer system, the stormwater flows untreated into the waterways. The Watershed Plan recommends that a feasibility study to explore opportunities for retrofitting the roadside swales into infiltration swales and rain gardens. By constructing infiltration swales and rain gardens in these areas, the volume and velocity of stormwater runoff generated in these neighborhoods can be reduced.

As a means of calculating the acreage of infiltration-based BMP, the Kane County Stormwater Ordinance retention requirement was utilized. This retention provision requires that the 0.75 inch rainfall event over the hydraulically connected impervious area of development be captured and stored. Table 5-9 lists the recommended acreage of infiltration-based BMP to be installed within each Project area. Note the acreage assumes that each BMP is approximately 1-foot in depth.

Table 5-9 Recommended Acreage of Infiltration-Based BMP

BM ID#	Project Area (acres)	Recommended Acreage of Infiltration-based BMP
54	185.3	4.2
62	29.2	0.66
63	42.1	0.95
64	33.6	0.76

The East Branch South Branch Kishwaukee River Watershed Plan also recommends the construction of infiltration-based BMPs in areas of re-development or new construction. For example, an expansion to the DeKalb County Government Center is planned in the near future. It is recommended that infiltration-based BMP such as bioswales and/or and bioinfiltration basins be utilized in the project design over traditional stormwater management techniques such as turf grass detention basins and turf grass swales.

<ins>BMP ID#52: Permeable Pavements</ins>

Permeable pavements refer to paving materials that promote the absorption of rainfall and snowmelt. With traditional pavement, the asphalt or concrete is sloped so that rain and snow melt is directed quickly into storm drains and off of the paved surfaces and into the storm sewer system or on-site detention basin. However, a permeable pavement system is constructed with an underdrain and infiltration trench comprised of gravel underneath the paver, porous concrete, or porous asphalt. Rain that falls on the permeable pavement infiltrates into the gravel and then into the soil and/or groundwater below. Once the storage capacity of the infiltration trench has been reached, the underdrain will convey the water into the storm sewer system or on-site detention basin. By infiltrating the majority of the stormwater that falls onto the permeable pavement, the amount of water and pollution flowing into storm sewers or directly into streams is greatly reduced. Thus, permeable pavement helps maintain a more stable baseflow to streams, reduces flood peaks, and reduces streambank erosion. Permeable pavement also has the ability to improve water quality. Suspended solids are removed through filtration of water through the gravel layer and dissolved pollutants such as nutrients and metals are removed and/or transformed as runoff infiltrates into the soil.

The East Branch South Branch Kishwaukee River Watershed Plan also recommends the use of permeable pavements in areas of re-development or new construction. For example, an expansion to the DeKalb County Government Center is planned in the near future. It is recommended that permeable pavements be used for its parking facility.

BMP ID#60: Wetland/Naturalized Detention Basin Retrofits

Traditional detention basins with turf grass side slopes are designed to prevent flooding by storing stormwater and slowly releasing the stored water into streams or storm sewers. Naturalized detention basins and wetland detention basins are designed not only to provide flood storage but also to treat stormwater and create wildlife habitat.

The greatest benefit of naturalized and wetland detention basins over traditional detention basins is the wetland bottom detention basin's ability to reduce the amount of pollutants in stormwater runoff. Suspended sediments and attached pollutants such as phosphorus and metals are settled out of the stormwater and captured in the basin. Dissolved pollutants such as nitrogen and organic matter is filtered out and/or transformed by the vegetation and as the runoff infiltrates into the underlying soils. The use of native plants on the side slopes also reduces shoreline erosion that is typically observed on turf grass basins. Wetland detention areas provide the most effective water quality benefits when they are at least 3-5 percent as large as the watershed they serve.

Naturalized detention basins typically have an open water basin with native grasses along the side slopes. In a naturalized detention basin retrofits the storage capacity of the basin remains unchanged but the side slopes are replanted with native grasses, shrubs and wildflowers.

Wetland detention basins are designed to mimic the stormwater benefits and aesthetics of natural wetland systems by utilizing wet-tolerant native plants on the side slopes and bottom of the basin. The basins are designed to hold water at all times, whether it be standing water above the ground surface or water saturated just below the soil's surface. Prior to the conversion of a traditional detention basin to a wetland detention basin, a hydrologic and hydraulic should conducted to determine the profile changes necessary in the basin to support wetland vegetation while maintaining its stormwater management function.

During the watershed planning process, moderate shoreline erosion was observed at the detention basin located north of Fulton Drive. As such, it is recommended that basin be naturalized as a means of correcting and preventing erosion.

5.4.6 Wastewater Treatment Polishing Wetlands

BMP ID#55 and 65: City of Sycamore WWTP and Village of Maple Park WWTP

There are two wastewater treatment plants (WWTP) located within the East Branch South Branch Kishwaukee River Watershed: City of Sycamore WWTP (BMP ID#55) and the Village of Maple Park WWTP (BMP ID#65). Both facilities have NPDES permits for their discharge (See Chapter 3.0 for more information on NPDES permits) and are in compliance with the requirements set forth in their permits. However, to ensure the long-term protection of the WWTPs receiving waters, the East Branch South Branch Kishwaukee River and Union Ditch #2, the Watershed Plan recommends that both WWTPs explore the feasibility of the construction of a wastewater treatment "polishing" wetlands as a part of any plant expansion.

Constructed "polishing" wetlands are engineered systems that have been designed and constructed to utilize the natural processes involving wetland vegetation, soils, and their associated microbial assemblages to assist in treating wastewater. These wetlands can provide an important "final touch" to conventional wastewater treatment processes, and are an especially attractive option for consideration if a new plant is being sited or an existing plant expanded. They are designed to take advantage of many of the same processes that occur in natural wetlands, but do so within a more controlled environment. Polishing wetlands can assist WWTPs in meeting and exceeding water quality standards. Wetlands are known to be effective in reducing levels of many pollutants, especially nutrients.

5.4.7 Other Projects

BMP ID#51: B&O Auto Yard

The B&O Auto Yard is an auto salvage yard located along the East Branch South Branch Kishwaukee River. Salvage yards provide a valuable service that contributes to our environmental quality of life through the recycling of auto parts and scrap metals, and conservation of our natural resources. However, without planning and preventative measures, stormwater runoff from the auto salvage operations has the potential to negatively impact water quality. Potential pollutants typically generated at auto salvage yards include oil and grease, ethylene and propylene glycol, total suspended solids (TSS), biological oxygen demand (BOD), heavy metals, and acidic pH.

It is recommended that the B&O Auto Yard develop a Pollution Prevention (P2) Plan that addresses the following waste streams and issues:

1. Practices for used fluids including antifreeze, cleaners, brake fluid, refrigerants, solvents, used oil, and window-washing fluid;
2. Practices for auto parts including airbags, batteries, brake shoes and clutches, catalytic converters, engines, glass, lead parts, mercury switches, radiators and heater cores, tires, torque converters, transmissions, upholstery, and used oil filters;
3. Hazardous waste;
4. Wastewater;
5. Stormwater;
6. Mobile wash services;
7. Storage tanks; and
8. Spill reporting.

Due to its location immediately adjacent to the East Branch South Branch Kishwaukee River and concerns of watershed stakeholders, it is recommended that the B&O Auto Yard conduct a stormwater sampling program to quantify the volume and quality of stormwater that is generated from the site. The results of the stormwater sampling should be used to develop stormwater management BMPs for the site operations. Stormwater BMPs could range from typical stormwater management facilities (detention basins, swales, etc) to engineered systems for treating stormwater runoff from industrial facilities.

BMP ID#53: Evergreen Mobile Home Park

DeKalb County, IL received a mitigation grant from the Federal Emergency Management Agency in June of 2012 to purchase and close the Evergreen Village mobile home park. The 125-unit mobile home park is located entirely within the floodway of the East Branch of the Kishwaukee River, and includes a sanitary treatment plant, paved access roads, and 300+ residents. The site has experienced repeated flooding throughout the 40 years it has been in existence, and is a source of pollutants within the watershed. The project, scheduled for completion by June of 2015, will return the 19.6-acre property to open space and maintain it as such in perpetuity.

5.4.8 Agricultural Projects/Practices

There are many best management practices (BMPs) that are available and appropriate for implementation in agricultural areas. The Natural Resource Conservation Service (NRCS) Illinois Field Office Technical Guides (FOTG) document conservation practices applicable to farming in Illinois and provide details on standards and specifications for these BMPs. The standards describe the conservation practices and where it applies; while the specifications describe the detailed site-specific requirements for constructing, installing, and/or implementing the practice. Many of the BMPs recommended in Chapter 5 of this Watershed-Based Plan are included in the NRCS Illinois FOTG.

As 84.34% (66455.72 acres) of the East Branch of the South Branch of the Kishwaukee River Watershed is used for agricultural purposes, the use of BMPs on agricultural lands is imperative to ensure the protection and improvement of water quality in the watershed. As selecting specific site locations for agricultural practices has many considerations including owner willingness to participate, land configuration, and crop management practices already in place, the Watershed-Plan includes a list of general practices that should be implemented throughout the watershed where practicable. These include: nutrient management and/or integrated pest plans, conservation crop rotation, conservation tillage, contour farming, terracing, grass waterways, water and sediment control basins, grade stabilization structures, drainage water management, streambank stabilization practices, and weirs and cross vanes. Each of these practices and their benefits are highlighted below.

Nutrient Management and/or Integrated Pest Plans

Nutrient management on agricultural fields is extremely important for preventing the loss of nutrients in stormwater runoff during and following rain and snowfall events. Developing a nutrient management plan allows farmers to adopt strategies for controlling and monitoring the form/type, placement, timing, and quantity of fertilizer applied to the fields. Similarly, integrated pest management (IPM) uses a systems based approach to reduce a farmer's dependence on pesticides and herbicides. Both nutrient management plans and IPMs can improve water quality by reducing the amount of pollutants (nutrients, herbicides, and pesticides) that run off of field and into the streams and wetlands and infiltrate into groundwater.

Conservation Crop Rotation

Crop rotation is the practice of growing various crops on the same field in a planned sequence. The rotation usually involves growing forage crops in rotation with various field crops. The benefits of crop rotation can include reduced runoff and erosion from the fields, reduced need for pesticide and herbicide application, and improvements to aesthetics and wildlife habitat.

Conservation Tillage

Conservation tillage is any method of soil cultivation that leaves the previous year's crop residue such as corn stalks on fields before and after planting the next crop, to reduce soil erosion and runoff. To provide these conservation benefits, at least 30% of the soil surface must be covered with residue after planting the next crop. Some conservation tillage methods forego traditional tillage entirely and leave 70% residue or more. The benefits of conservation tillage include reduction of soil erosion by as much as 60%-90%, conservation of water by reducing evaporation at the soil surface, conservation of energy due to fewer tractor trips across the field and the crop residue provides food and cover for wildlife.

Cover crops

Cover crops are grasses, legumes or forbs planted to provide seasonal soil cover on cropland when the soil would otherwise be bare such as before the crop emerges in spring or after fall harvest. Benefits of cover crops include the reduction of wind and water erosion when the soil would otherwise be bare and the protection of groundwater quality by preventing nitrogen from leaching into the water table.

Contour farming

Contour farming is growing crops "on the level" across or perpendicular to a slope rather than up and down the slope. The rows running across the slope are designed to be as level as possible to facilitate tillage and planting operations on the contour. Benefits of contour farming include a reduction of soil erosion by as much as 50% from up and down hill farming and improvements in water quality though reducing nutrients loads and promotion of infiltration.

Terracing

A terrace is an earthen embankment, ridge or ridge-and-channel built across a slope (on the contour) to intercept runoff water and reduce soil erosion. Terraces are usually built in a series parallel to one another, with each terrace collecting excess water from the area above. Terraces can be designed to channel excess water into grass waterways or direct it underground into the drain tile system.

The use of terraces in agricultural areas can protect and improve water quality by reducing soil erosion by breaking long slopes into a series of shorter ones, intercepting agricultural runoff, and prevent gully formation by directing runoff to stable outlets.

Grass Waterways

Grass waterways are a type of conservation buffer. They are constructed graded channels that are seeded to grass or other suitable vegetation. Grass waterways are generally broad and shallow and are designed to prevent soil erosion while draining runoff water from adjacent cropland. Fabric and rock checks may be installed within the grass waterways to help stabilize the channel until vegetation is established. As water travels down the waterway, the grass vegetation prevents erosion that would otherwise result from concentrated flows. Grass waterways also help prevent gully erosion in areas of concentrated flow.

Grass waterways work best when erosion is controlled on the contributing upland drainage area; otherwise the waterway will become filled with sediment and cease to function properly. As such, grass waterways are commonly used in conjunction other upland erosion control practices such as terraces, contour farming, water & sediment control basins, conservation tillage, conservation crop rotation and cover crops.

Water and Sediment Control Basins

A water and sediment control basin (WASCOB) is a small earthen ridge-and-channel or embankment built across (perpendicular to) a small watercourse or area of concentrated flow within an agricultural field. They are commonly built in a parallel series with the first ridge crossing the top of the watercourse and the last ridge crossing the bottom, or nearly so. They are designed to trap agricultural runoff water and sediment as it flows down the watercourse; this keeps the watercourse from becoming a field gully and reduces the amount of runoff and sediment leaving the field.

WASCOBs are similar to terraces in form and function, but the two practices are not interchangeable. Whereas terraces (and other contour practices, such as contour stripcropping and contour buffer strips) work best on relatively uniform slopes, WASCOBs are generally reserved for fields with irregular topography where contour practices would be difficult to implement or likely to fail.

While terraces generally extend all the way to field edges, following the contour of a slope in a ribbon-like pattern, WASCOBs from a distance look more like short, straight slivers, just long enough to bridge an area of concentrated flow. WASCOBs are generally grassed. The runoff water detained in a WASCOB is released slowly, usually via infiltration or a pipe outlet and tile line.

The use of WASCOBs in agricultural areas can protect and improve water quality by reducing agricultural runoff and sediment loading, reduce the potential for gullies to form in areas of concentrated flows on the fields, and control erosion in hilly areas where the slopes are not uniform enough to use practices that follow the contour such as terraces.

Grade Stabilization Structures

A grade stabilization structure is an embankment or spillway built across a drainageway to prevent soil erosion. Grade stabilization structures are especially important in areas where sediment loading from gully erosion is a major water quality concern.

Gullies tend to advance upslope at overfalls (small, concentrated waterfalls) below which turbulent water undercuts the head of the gully—a process called head-cutting. Grade stabilization structures control the way water falls to lower elevations, preventing gullies from forming or advancing.

There are many types of grade stabilization structures including block chutes, rock chutes, toewall structures, modular block straight drop structures and pipe drop structures. Some are full-flow, allowing water to flow freely over a spillway. Others look like a pond and are designed to detain water behind an embankment. Grade stabilization structures are also used to stabilize erosion-prone sites where a tributary or tile drainage outlet enters a channel such as a ditch from the side; the grade stabilization structure slows the flow of water from the higher elevation of the tributary or side-inlet (where water is entering) to the lower elevation of the channel.

Grade stabilization structures have numerous water quality and stormwater management benefits. These include: reducing soil erosion by preventing gullies from forming or advancing at field edges and other overfalls; reducing peak stormwater flows; reducing and reducing sediment loading in streams, ditches, and wetlands.

Drainage Water Management

Drainage water management is the practice of using a water control structure in the main, submain, or lateral drain tiles to manage water table elevation and the timing of water dischargers from surface and subsurface agricultural drainage systems. The theory of drainage water management is to hold the water and pollutants such as nitrogen, phosphorus, and sediment in the agricultural fields when they are not needed for production. For example, after the harvest, the tile system is restricted using flashboards allowing water to pool on the in the subsurface soils and/or on the fields. Prior to field activities, the flashboards are pulled to allow surface and ground water levels to drop to levels sufficient for planting. After plantings, some flashboards could be replaced to maintain a water level that provides capillary water to the plant's root zones. This manipulation of water levels allows for subsurface water storage on the field during fallow times, as well as, during the growing season.

Benefits of drainage water management include reduction in nutrient loading especially nitrogen. Published studies have found reductions in annual nitrate load in drain flow ranging from about 35% to 81%, on fields using drainage water management in Illinois.

Stream Stabilization Practices

Streambank stabilization involves using vegetation or materials such as riprap or woody debris to stabilize stream, river or ditch banks in order to protect them from erosion or sloughing. The four main practices used in Illinois by the NRCS for streambank stabilization include rock riffle grade control, stone toe protection, bendway weirs, and stream barbs.

Stream stabilization in agricultural areas has numerous benefits including:

- Stabilizes banks and shores, preventing further erosion and degradation;
- Improves water quality by reducing sediment loads in surface waters;

- Helps maintain the capacity of waterways to handle floodwaters, preventing flood damage to utilities, roads, buildings and other facilities;
- Reduces expenses for dredging sediment from lakes and drainage ditches;
- Enhances habitat for fish and other aquatic species by improving water quality and moderating water temperature; and
- Creates habitat for terrestrial wildlife.

Weirs and Cross Vanes

The lack of instream features including pools and riffles is prevalent throughout the watershed. The lack of instream features can be observed in both the man-made ditches and natural stream channels. In-channel BMPs such as boulder weirs and cross vanes can improve water quality by reducing streambank erosion, trapping suspended sediment, and re-oxygenating the water column. In-channel BMPs also provide habitat that supports the propagation of fish and macroinvertebrates.

Built from rocks, logs, or other sturdy material, weirs establish a fixed elevation in the channel and prevent gully erosion caused by channelization. This is done by concentrating flows in the center of the channel. Weirs can provide improvements to water quality, as well as, habitat enhancement. Benefits of weirs include formation of pool habitat, promotion of bar/riffle formation, trapping suspended sediments, re-oxygenating water, allowing organic debris deposition, promotion of invertebrate production, and can distribute water for off channel watering facilities.

Cross vanes are V-shaped instream diversions that can effectively convey stream flow while maintaining the transport of sediment. The cross-vane is a grade control structure that decreases near-bank shear stress, velocity and stream power, but increases the energy in the center of the channel. Cross veins can reduce bank erosion, create a stable width/depth ratio, maintain channel capacity, while maintaining sediment transport capacity of the channel.

In addition to these general agricultural BMPs and practices described above, the Watershed Steering Committee has selected five agricultural practices to highlight as recommendation for the East Branch South Branch Kishwaukee River watershed: riparian buffers, installation of 2-stage channels, removal of spoil piles to reconnect channels to the floodplain, wetland creation and streambank stabilization practices. For each of these six practices, the Watershed Plan has set short term (less than 5 years), medium term (5-10 year), and long term (more than 10 year) “targets” for implementing the practices in the watershed. Table 5-10 details the targets for agricultural BMPs in the East Branch of the South Branch of the Kishwaukee River Watershed.

Table 5-10 Targets for agricultural BMPs in the East Branch of the South Branch of the Kishwaukee River Watershed

Agricultural BMP	Short Term Target (less than 5 years)	Medium Term Target (5-10 years)	Long Term Target (longer than 10 years)
Riparian Buffers	30 additional acres	40 additional acres	45 additional acres
Installation of 2-Stage Channels	4,000 linear feed	6,000 linear feet	9,000 linear feet
Removal of Spoil Piles to Reconnect Channels to Floodplain	n/a	n/a	n/a
Wetland Creation	200 acres	300 acres	500 acres

Riparian Buffers/Vegetative Filter Strips

Riparian buffers (also called vegetative filter strips) are areas of grasses, trees, and other vegetation located adjacent to a waterway that are managed to reduce the negative impact of nearby land uses. Riparian buffers provide several water quality and habitat benefits by 1) separating the crop field from the stream; 2) filtering runoff to remove sediment, nutrients, pesticides and microorganisms; 3) increasing ground water infiltration; 4) taking up nitrate from shallow groundwater 5) providing stormwater storage; 6) stabilizing streambanks; and 7) providing cooler water and air temperatures.

The vegetation and width recommendation for riparian buffers is dependent on the goals and benefits that the buffer is expected to provide. For example, water temperature modification can be achieved with a minimum 10- to 15-foot buffer, reduction in nutrient loading is achieved with a 35- to 100-fot buffer, and flood control benefits are in the 75- to 200-foot range. While there are many environmental and social benefits derived by the presence of riparian buffers, the East Branch South Branch Kishwaukee River Watershed Plan focuses on those benefits that are compatible with the dual ideals of resource protection and the continuance of economically viable agricultural operations. The DeKalb County Watershed Steering Committee has set the following benefits as the primary objective for buffer installation in the watershed:

- Sediment Control
- Nutrient Removal
- Streambank Stabilization
- Wildlife Habitat Improvements

Given the goals and objectives of this watershed plan, it is recommended that minimum 35-foot riparian buffers be established on all constructed agricultural waterways and minimum 50-foot riparian buffers be established on natural waterways. The riparian buffers should be planted with native grasses and wildflowers.

Regularly scheduled maintenance should begin immediately after the buffer has been planted. It is recommended that the established riparian buffers be maintained using mowing and/or prescribed burns over clearing and grubbing. Clearing and grubbing is commonly done with earth moving equipment that leaves the soil exposed and un-vegetated thus increasing the potential for erosion and decreasing the effectiveness of the buffer. Both mowing and burning allow for the root structure of the plants to stay intact, thus reducing impacts to buffer effectiveness.

Native grass zones in a riparian buffer can benefit from mowing during the early years of establishment. Native prairie grasses and wildflowers are often slow growing above ground during the first year or two after establishment because much of their energy is put into producing a root system. During this time annual weeds rapidly become established and provide competition to the establishing native plants. Because of these challenges, mowing a prairie filter during the first and second year is recommended.

Where practicable, fire is a good maintenance tool for native grass and forb plantings in riparian buffers. To reduce weed competition during the year, prescribed burns are usually performed early in the spring. During this time, many of the competing cool-season grasses, weeds, and woody plants begin growing while the native prairie plants are still dormant. While different burning frequencies may be used, an annual spring-burn for the first three or four years is recommended. Following establishment of a good stand of desired grasses and forbs, a burning cycle of once every three to four years can be used.

Replanting and reseeding may also be required during the first few years following establishment. An annual inspection should be made to identify areas in need of replanting/reseeding. Replanting can be done in the spring or fall.

According to information provided by the DC SWCD there are currently 36 acres of riparian buffers and 36 acres of vegetative filter strips in the DeKalb County portion of the watershed. Information on acreage of existing riparian buffers and vegetative filter strips was not available for Kane County. Using the existing 72 acres of riparian buffer/vegetative strips in the watershed as a starting point, the Watershed-Based Plan sets a goal on increasing the quantity of riparian buffers/vegetative filter strips in the watershed by 40% each 5 years. The target acreages for riparian buffers/vegetative filter strips are 30 acres in years 1-5, an additional 40 acres in years 5-10 and an additional 55 acres in years 10-15 for a total of 125 acres by year 15.

Installation of 2-Stage Channel

Drainage has long been an important component in agriculture and property management. Land with flat, poorly drained soils such as found in the East Branch South Branch Kishwaukee River Watershed requires intensive draining using field tiles in order to successfully grow crops. In addition to the installation of field tiles to drain the land, existing streams were straightened and new ditches were cut to facilitate the removal of the water from the fields. Over time, these stream channels and ditches have experiences bank erosion and scour due to being undersized for the amount of water flowing through them. The "undersized" nature of the streams and ditches has also lead to localized flooding of areas adjacent to the waterways.

Two-stage ditches should be installed in these areas to relieve the erosion, scouring and flooding that conventional ditches have caused. A two-stage ditch incorporates a floodplain zone, called benches, into the ditch by excavating the ditch banks roughly 2-3 feet above the bottom and creating a shelf. This allows the water to have more area to spread out on and connects with a floodplain storage area.

Two-stage ditches have both improved drainage function and ecological function over traditional agricultural ditches. The main water quality benefit associated with the in installation of two-stage ditches throughout the East Branch South Branch Kishwaukee River Watershed is the reduction of non-point source pollutants including sediment generated from erosion and in-stream sediment movement and the reduction of nutrient (phosphorus and nitrogen inputs). Additional benefits include the creation of wildlife habitat.

Two-stage channels can be used in conjunction with buffers, or they may be implemented on their own. The proposed hydrologic and hydraulic modeling effort would provide the tool that would allow for detailed planning, design and permitting for the creation of two-stage channels. In general, they will be reaches that are confined, but not so highly incised that there is additional earthwork or overburden involved in pulling back the banks. Based on the understanding and knowledge attained during the watershed planning process, it is estimated that approximately 5 percent (19,000 linear feet) of the total waterway length could be identified as priority areas for implementation of two-stage channels. It is recommended to implement two stage channels as follows: 4,000 feet in years 1-5; 6,000 linear feet in years 5-10; and 9,000 feet in years 10-15.

Removal of Spoil Piles to Reconnect Channel to Floodplain

As discussed previously in the Watershed-Based Plan, the majority of the stream channels and ditches have been constructed and/or channelized. During the earthwork associated with these activities, in many locations, the spoil piles from the excavations were windrowed (sidecast) along the sides of the channel. In some areas, this placement of soils has caused a "disconnect" between the channel and its floodplain and channel-side wetlands. In an unaltered systems, during high flow events, water would be able to safely overflow from the channel and be stored in the floodplain and/or channel-side wetlands where it would be stored, infiltrated into ground water, and slowly released back into the channel. However, in some locations, the spoil piles found along the watershed's waterways are preventing the water from reaching the floodplain and wetlands leading to higher flows in the channels. These higher flows lead to channel erosion, scour, and downstream flooding. The spoil piles should be removed to open floodplain up to floodwaters and wetland areas in accordance with the Army Corp standards using stabilized inflow and outflow standard designs at the channel slope. Additionally, all removed soils should be properly disposed of in upland areas and not in floodplain or wetlands.

Based on inspection of the topography for the watershed, and based on the field reconnaissance, this presence of soil piles is not a widespread problem in the watershed. Removal of these spoil piles can be done on an as-identified basis. The best way to accomplish these projects would be to incorporated tem into the establishment of buffers or two-stage channel construction.

Wetland Restoration

Wetland restoration reestablishes or repairs the hydrology, plants and soils of a former or degraded wetland that has been drained, farmed or otherwise modified since the watershed was inhabited. The goal of wetland creation is to closely approximate the original wetland's natural condition which resulting in multiple water quality and stream habitat benefits.

Restoring wetland hydrology typically involves breaking drainage tile lines, building a dike or embankment to retain water and/or installing adjustable outlets to regulate water levels. Once hydrology is restored, wetland plants usually include a mix of native water-loving grasses, sedges, rushes and forbs (broad-leaved flowering plants) in the restored wetland and a mix of native grasses and forbs in upland buffers around the wetland.

Wetland restoration has numerous benefits including:

- Improves surface and ground water quality by collecting and filtering sediment, nutrients, pesticides and bacteria in runoff;
- Reduces soil erosion and downstream flooding by slowing overland flow and storing runoff water;
- Wetland plants and ponded conditions utilize trapped nutrients, restore soil organic matter and promote carbon sequestration;
- Provides food, shelter and habitat for many species and enables the recovery of rare or threatened plant communities;
- Restored wetlands provide breeding grounds for ducks, pheasants, and other migratory waterfowl whose habitat is threatened; and
- Connects fragmented habitat when part of a larger complex of wetlands.

According to information provided by the DC SWCD, there are 123.21 acres of wetland restoration in the DeKalb County portion of the Watershed. Information on acreage of existing wetland restoration was not available for Kane County. As discussed in Chapter 3 Section 3.12.6, potential restoration sites were identified using a Geographic Information System (GIS) exercise. This analysis identified 789 potential wetland restoration sites (17,707.61 acres) within the watershed. Additional criterions and a rating scale (1-5 with 5 being the most suitable for restoration) were then used to better identify potential wetland sites. Of the 789 sites (17,707.61 acres) originally identified, 9 sites (177.6 acres) had a value of 5. One hundred and fifty one (151) (4,406 acres) potential restoration sites had a ranking of 4. Using the results of the potential wetland restoration site analysis and best professional judgment, it is recommended to implement wetland restoration as follows: 200 acres in years 1-5; 300 acres in years 5-10; and 500 acres years 10-15.

5.5 Water Quality Monitoring Plan

As detailed in Section 3.14, limited water quality monitoring data is available for the East Branch South Branch Kishwaukee River Watershed. A comprehensive water quality monitoring program should be implemented in the East Branch South Branch Kishwaukee River Watershed aimed at assessing the current condition of the East Branch South Branch Kishwaukee River Watershed and to assess changes in water quality associated with the implementation of the watershed-based plan. A quality assurance project plan (QAPP) should be developed for the comprehensive monitoring program.

It is recommended that Northern Illinois University and their partnership with Sycamore High School and the Watershed Steering Committee take the lead on implementing the water quality monitoring plan in the East Branch South Branch Kishwaukee River Watershed.

Baseline Sampling

Chemical and Physical Water Quality Monitoring

Baseline Sampling

Baseline sampling is regularly scheduled water quality sampling designed to obtain a long term record of water quality in the watershed. Sampling is typically conducted on a weekly, monthly, or yearly basis. Baseline chemical and physical water quality monitoring typically includes monitoring for nutrients, suspended solids, water clarity, dissolved oxygen, temperatures, conductivity, and pH. Due to the frequency of sampling, a baseline program can be expensive so budget is a significant considering in determining the number of sampling sites and the frequency of the sampling.

It is recommended that baseline stream sampling be conducted in the East Branch South Branch Kishwaukee River Watershed at the eight sites established as part of the watershed planning process (Table 5-11). Baseline sampling of these sites will give an overall picture of stream health of the entire watershed. The sites should be sampled on an annual basis. See Table 5-11 for details and the locations of the recommended baseline sampling sites.

Table 5-11 Data Collection Sites in East Branch South Branch Kishwaukee River Watershed

Site Name	Location
East Branch of the South Branch Kishwaukee River	Near Motel Road
Blue Heron Creek	Near Motel Road
Union Ditch #1	Near Hartmann Road
Union Ditch #2	Near Maple Park Road and railroad tracks
Union Ditch #3	Near Airport Road
Virgil Ditch #1	Near Thatcher Road
Virgil Ditch #2	Near Welter Road
Virgil Ditch #3	Near Winters Road

At each sampling site, it is recommended the following, at a minimum, parameters being analyzed as part of the baseline sampling program:

- Temperature
- Conductivity
- pH
- Dissolved Oxygen
- Total Suspended Solids (TSS)
- Total Nitrogen (TN)
- Total Phosphorus (TP)

It is recommended that the water quality samples for TSS, TN, and TP be collected using grab sampling methods. Samples should be collected using careful collection and handling procedures to ensure that the samples are representative and uncontaminated. The collected samples should be submitted for analysis at an Illinois Environmental Protection Agency (IEPA) accredited lab. Temperature, conductivity, pH, and dissolved oxygen measurements should be collected in the field using portable instruments. To ensure the proper collection and handling, a Quality Assurance Project Plan (QAPP) should be developed for the baseline sampling program.

Stormwater Sampling

Stormwater sampling is water quality sampling immediately following storm events designed to quantify pollutant loading to the creek from runoff events. This information is useful in refining the pollutant loading calculations generated by the PLOAD model to better reflect watershed conditions. It is recommended that stormwater sampling be conducted at each of the baseline sampling sites at a frequency of every 3-5 years, depending on budget constraints. Stormwater samples should be collected within 12 hours of a significant rainfall event (>1.0 inches) and all the stormwater samples should be collected on the same day. The stormwater sampling program should mirror the baseline sampling program in regards to analyzed parameters, sampling methods, and quality assurance/quality control.

Biological Monitoring

Monitoring the biological communities including macroinverterbrates and fish are extremely useful for assessing the health of a stream system. As both fish and macroinvertebrates live in water for all or part of their lives, their survival is related to water quality. These animals are sensitive to different chemical and physical conditions in the water such as increased water pollution or changes in water flow. As such, the richness of fish and macroinvertebrate community composition in a stream or river can be used to provide an estimate of stream health.

Macroinvertebrate Sampling

It is recommended that benthic macroinvertebrate sampling be conducted at each of the eight established sites (Table 5-10). These sites should be sampled on a 5 year basis to provide a baseline on the overall health of the East Branch South Branch Kishwaukee River stream system. Baseline sampling at this location will also provide information on water quality changes resulting from the implementation of the watershed plan.

Macroinvertebrate sampling should also be conducted in stream segments immediately preceding and following the completion of stream restoration and stream habitat enhancement project completed during the implementation phase of the watershed plan. Macroinvertebrate sampling should be conducted prior to the construction of the project and 1-3 years following the completion of the project in order to quantify the success of the project on improving water quality and instream habitat conditions.

Fish Sampling

It is also recommended that watershed stakeholders work with the Illinois Department of Natural Resources (IDNR) and the Illinois Environmental Protection Agency (IEPA) to continue to conduct fish sampling at the established site in the East Branch South Branch Kishwaukee River Watershed on a 5-year interval. See Section 3.13.6 for more information on the fish sampling previously conducted by IDNR.

Habitat Assessment

NIU used a modified qualitative habitat evaluation index (QHEI) to evaluate the stream condition in the watershed. The QHEI gives scientists a qualitative assessment of physical characteristics of a sampled stream similar to IBI biological data. QHEI represents a measure of instream geography. This comprehensive assessment is critical for evaluating disturbance and land use practices.

The RBP evaluation should be conducted prior to the construction of the project and 1-3 years following the completion of the project in order to quantify the success of the project on improving instream and riparian habitat conditions. Details on the RBP for Habitat are included in Section 3.11.

Hydraulic and Hydrological Sampling

To supplement the water quality and habitat monitoring conducted in the East Branch South Branch Kishwaukee River Watershed, it is important to also assess hydraulic and hydrological conditions of the watershed. As detailed in the previous sections of the watershed plan, a significant portion of the watershed has been channelized and constructed as manmade ditches. This has lead to increase in the total volume and rate of stormwater entering the stream system causing high fluctuations in the water levels and flows in the watershed. These rapidly changing fluctuations are the predominate cause of the hydromodification that is prevalent throughout the watershed. In order to understand and define these hydrological impacts, it recommended that stream flow and stage monitoring be conducted in the East Branch South Branch Kishwaukee River Watershed. When combined with the water quality data collected, the collected stream flow and stage monitoring data will also be useful in refining pollutant load calculations in the watershed.

Flow and water level monitoring

It is recommended that stream flow and water level measurements be based on the methodology outlined in *Discharge measurements at Gaging Stations, U.S. Geological Survey, Techniques of Water-Resources Investigations, Book 3, Chapter A8* by T.J. Buchanan and W.P. Somers. It is recommended that the stream flow and water level be integrated into the baseline and stormwater sampling monitoring program of the sites located in the watershed. All eight sites should be monitored on the same day.

Additional sites for stream flow and stage monitoring may be identified during future Hydraulic and Hydrologic efforts and should be added as necessary.

Stream Bank and Bed Erosion and Deposition Measurements

Stream bank and bed erosion and deposition measurements should be collected at locations in the East Branch South Branch Kishwaukee River watershed that represent typical conditions for the stream network. It is recommended that stream bank and bed erosion and deposition be quantified using the following methods:

- Erosion pins
- Erosion chains
- Stream cross-sections

Measured over time the erosion pins provide a measurement of recession or deposition rates. To measure streambed scour, scour chains should be used. To confirm the rates of erosion and deposition at each study reach, stream-cross-sections should also be surveyed.

5.6 Education and Outreach Plan

The cumulative actions of thousands of individuals can either improve water quality, flooding, and natural resources or further degrade them. As such a watershed-based plan must include a strategy to educate and inform watershed stakeholders about watershed issues and encourage them to take an active role in implementing the watershed-based plan. Because many watershed problems are caused by individual actions and their solutions are often voluntary practices, effective public involvement and participated are necessary for the successful implementation of the plan. Furthermore, the general public is often unaware of the environmental impact their day to day activities have on the watershed's resources. With an understanding of watershed issues, watershed stakeholders can play a critical role in protecting and restoring water quality.

This section of the Action Plan includes:

- Primary goals addressed by each action;
- Targeted audiences and partner organizations;
- Best package (vehicle) for the action message for delivery to the targeted audience;
- Lead and supporting organizations; and
- Potential outcomes

The East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) Watershed Steering Committee Steering Committee (Watershed Steering Committee) Education Sub-Committee will lead the efforts to build and implement the education and outreach campaign.

5.6.1 Education and Outreach Strategy for the East Branch of the South Branch of the Kishwaukee River watershed

Development of an effective Education and Outreach Plan begins by defining E&O goals and objectives. Watershed Steering Committee specifically addressed watershed information and education issues by developing an education goal. The education goal for the plan reads:

F. Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

The E&O Plan includes program needs related to each of the watershed goals outlined in Chapter 2. Table 5-10 includes the E&O Plan for the East Branch South Branch Kishwaukee River watershed.

5.6.2 Target Audience

The primary target audiences for the Education and Outreach (E&O Plan are 1) residents and other landowners, 2) Land and resource managers and organizations, 3) Government officials and agencies, and 4) Developers and contractors. Each of these targeted audiences can be broken down into more specific sub-groups as detailed below:

1. Residents, other landowners, and visitors
    a. Riparian landowners and residents (RR)

        i. Rural areas
        ii. Urban/Suburban areas
    b. Non-riparian landowners and residents (NR)
        i. Rural areas
        ii. Urban/Suburban areas
    c. Homeowner Associations (HOA)
    d. General public and visitors (GP)
    e. Businesses and industrial properties (BI)
2. Land and resource managers and organizations
    a. Land and resource managers including golf courses and farmers (LM)
    b. Organizations, committees, and special interest groups involved in water resource management (OG)
3. Government officials and agencies
    a. Local governments including municipalities, townships, park districts, health departments, transportation departments, and other departments that manage land within the watershed (LG)
    b. Schools (S)
4. Developers and contractors
    a. Developers and home builders (DH)
    b. Consultants and contractors including civil engineers, planners, and landscapers (CC)

The abbreviations are keyed to the Education and Outreach Plan in Table 5-12.

To determine programming needs for each audience, Watershed Steering Committee Education Sub-Committee should reach out and speak with representatives from each group to determine their level of understanding of watershed issues. The intent of this plan is to include both existing partners, as well as stakeholders that have previously not been participants in the watershed planning process. It is critical that the E&O Plan address the needs of both groups.

5.4.3 Partner Organizations

Organizations that can assist with the implementation of the Education and Outreach Plan are the same as those charged with implementing the Programmatic and Site Specific Action Plans. These same organizations may also serve as targeted audiences for programs. These organizations are listed in Section 2 of this chapter.

5.4.4 Evaluating the Education and Outreach Plan

Actual reduction in water quality and habitat degradation in the watershed is perhaps the best indication that the Education and Outreach Plan is successful. Although it is extremely difficult to attribute water quality and habitat improvement to a specific action item in the Education and Outreach Plan, there is little doubt that increased knowledge and understanding of watershed issues and solutions is essential to improving water quality and stream health and reducing flooding in the watershed. As such, it is extremely important to regularly evaluate the E&O plan to ensure the programs are being effective. Evaluation conducted early in the process will help determine which programs are meeting their goals and which are not. This will allow for timely refinements to the E&O program to maximize efforts and facilitate plan implementation. Chapter 6, Section 6.5.1 contains "Report Cards" with milestone related to watershed education that can be used to access the E&O efforts.

Table 5-12 Education and Outreach Action Plan

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate the public about general watershed issues.	All Goals	GP	• Signs at stream crossings and watershed boundaries. • Messages in community newsletters. • Post watershed maps in public buildings. • Distribution of Fact Sheets at libraries and other municipal buildings. • Watershed tours.	DCCF	• General public participate in watershed events and activities. • General public requests additional information on watershed activities.
Educate the public that a watershed-based plan has been developed for the watershed to gain interest for implementing Action Items.	All Goals	GP	• Website. • Public interest message on radio. • Articles in newspaper. • Community meetings.	DC, KC, DCWSC, DCCF	• General public requests additional information on watershed-based plan. • Majority of watershed residents have a working knowledge of watershed conditions and know how to get involved in plan implementation. • Public begins to make small changes in day to day behaviors aimed at improving water quality and habitat in the watershed.
Maintain the watershed planning website	All goals	All stakeholders	• Maintain the website to keep the public informed on plan implementation activities.	DC, DCWSC	• Increase in the number of visitors to the website. • Website users have information related to the watershed including potential and ongoing projects, watershed problems, and a calendar of upcoming events.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Provide training and educational outreach to municipal officials and engineers on the goals, objectives, recommendations, and implementation of the watershed-based plan.	All goals	LG, CC	• Meet with elected boards to promote the Watershed-Based Plan. • Presentation at County, City and Village Board Meetings. • Meet with consulting engineers to promote the Watershed-Based Plan.	DC, KC, DCWSC, DCCF	• All elected officials are familiar with the Watershed-Based Plan. • Local governments adopt the Watershed-Based Plan. • Local governments update stormwater ordinances to reflect plan recommendations.
Educate riparian landowners on their responsibilities and easement requirements.	A & C	RL	• Hold riparian owner training workshops. • Develop and distribute an information booklet/pamphlet. • Host stream cleanups.	SWCD, USDA	• Number of reported debris blocks decrease. • Problems are reported to the proper authorities.
Educate homeowners on how to best maintain septic systems	A	RR, NR	• Distribute educational letters to all residents with septic systems.	DC, KC	• Owners act quickly to mitigate and repair problems with their septic system. • Owners understand the impact poorly maintained and broken septic systems have on water quality. • Elimination of “straight-pipes”.
Educate the general public on the importance of groundwater quality and quantity.	A	GP	• Hold education workshops to educate the general public on groundwater related issues. • Hold field trips to educate the general public on the importance of groundwater recharge.	DC, KC, DCWSC, DCCF	• Attendees gain a better understanding of groundwater related issues. • Attendees inform their neighbors of information they learned at the workshops and field trips.

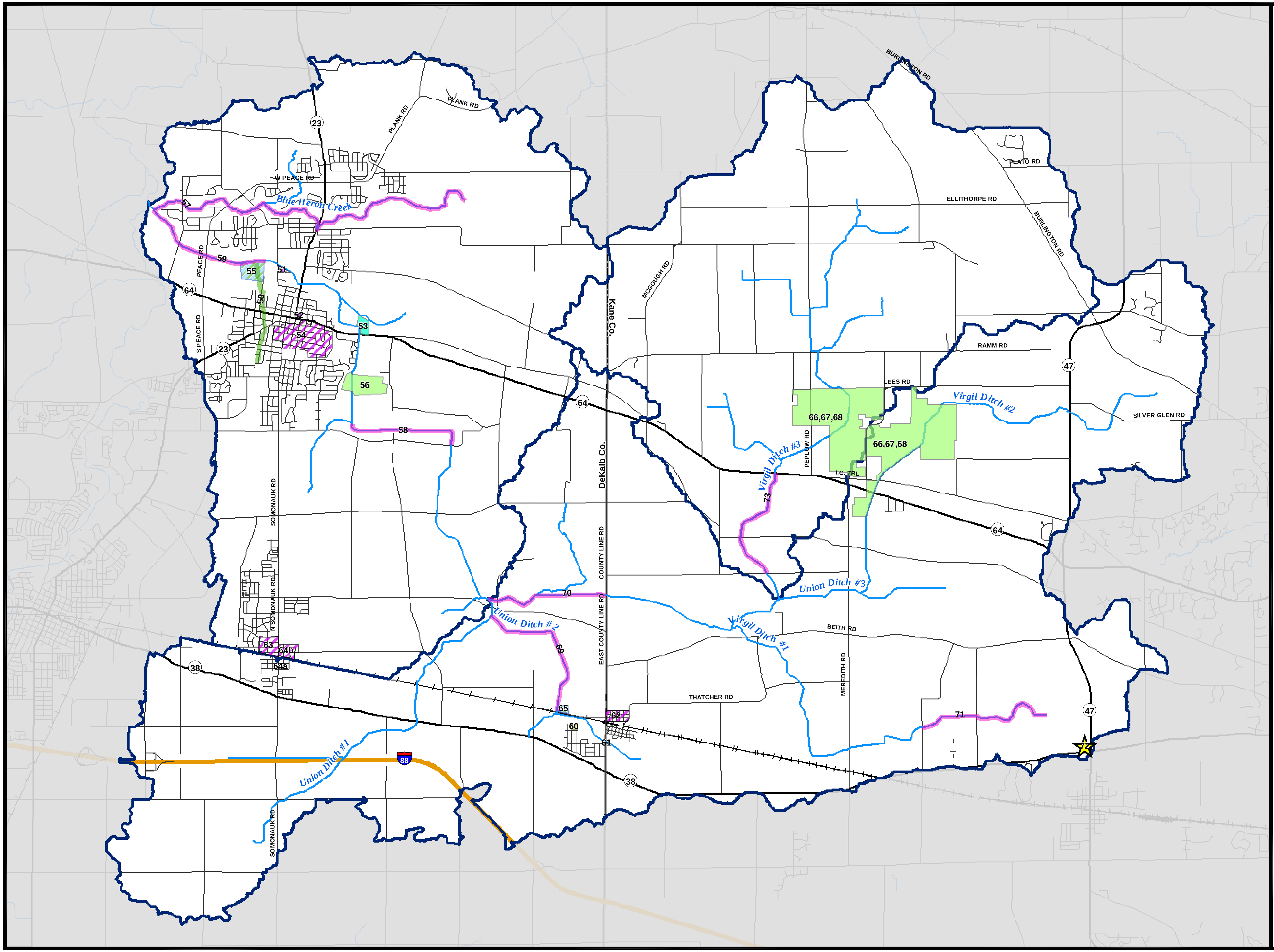
Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate owners/developers of existing and new developments on ways to reduce volume and rate of stormwater runoff.	A & B	HOA, BI, DH, CC, LG	• Meet on a case-by-case basis to develop strategies and incentives for reducing impervious areas. • Distribute fliers to existing HOAs and businesses that highlight the benefits and funding sources for retrofitting existing stormwater management facilities. • Hold training seminars on stormwater BMPs. • Install stormwater BMP demonstration projects.	DC, KC, DCWSC, DCCF	• Municipalities, businesses, and HOAs realize the potential that naturalized detention basins have to improve water quality and reduce flooding. • Municipalities, businesses, and HOAs implement maintenance programs for all existing stormwater management facilities.
Educate municipalities, HOAs, and businesses on importance of and how to maintain naturalized detention basins.	A, B, C, & D	RR, HOA, BI, LG	• Meet with landowners, municipalities, and others who manage these facilities. • Develop and distribute an information booklet/pamphlet. • Hold technical workshops that provide information on detention basin retrofits and stress maintenance needs for existing facilities.	DC, KC, DCWSC, DCCF	• Number of retrofit projects increase. • Detention basins are monitored, maintained, and repaired on a regular basis.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate HOA, developers, and municipalities about the importance of protecting open space.	A, C & D	DH, CC, HOA, LG	• Meet on a case-by-case basis to develop strategies and incentives for developing and preserving open space. • Municipalities use zoning to protect open space and natural areas. • HOAs and developers allocate funding to the protection and restoration of open space. • Distribute copies of the DeKalb County Greenway and Trails Plan. • Presentations on open space at community and board meetings.	DC, KC, DCWSC, DCCF	• Voluntary preservation and restoration of open space. • Linear feet of trail in the watershed increases. • Number of municipalities adopting the DeKalb County Greenway and Trails Plan increase. • Number of government officials and board members reached at community meetings.
Educate municipalities and landowners on stream maintenance strategies aimed at removing debris and repairing problem hydraulic structures.	A & B	RR, HOA, LG	• Meet with landowners, municipalities, and others who manage these facilities. • Hold training seminars on stormwater infrastructure management.	DC, KC, DCWSC, DCCF	• Number of reported debris blocks decrease. • Number of reported culvert issues decrease. • Infrastructure problems are reported to the proper authorities.
Provide information to residents living within and along the 100-year floodplain on the benefits of a functional floodplain.	A & B	RR	• Develop and distribute an information booklet/pamphlet. • Provide contacts for flood assistance on the website. • Hold workshops for landowners on flood proofing and flood awareness.	DC, KC	• Number of flood prone properties owners reached increase. • Number of structures insured, flood proofed, or removed from the flood prone areas increase.
Educate landowners and municipal Public Works about the use of environmentally-friendly (phosphorus-free) fertilizer.	A	GP, LG	• Develop and distribute an information booklet/pamphlet. • Use media (radio, newspapers, website, etc) to communicate the negative impacts of using a phosphorus-based fertilizer.	DC, KC, DCWSC, DCCF	• Decrease in the number of Public Works and homeowners utilizing phosphorus-based fertilizers

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Provide information to residents and business owners on the benefits of native landscaping.	A & C	RR, NR, HOA, BI, CC	• Offer free workshops that help individuals choose the appropriate native plants and trees for their yards, planting beds, etc. • Host native plant and seed sales and exchanges.	USDA, SWCD, DCCF	• Stakeholders can identify native plants. • Number of native plantings in residential yards and near businesses increase. • Stakeholders recognize the benefits of native plants on water quality and habitat.
Educate riparian property owners on ways on streambank stabilization methods that promote water quality and stream habitat.	A, B & C	RR, HOA, BI, CC	• Conduct technical workshops for riparian property owners that recommend bioengineering options, funding sources, and certified contractors for stabilizing eroded streambanks. • Install streambank stabilization demonstration projects. • Provide stream stabilization and restoration stewardship volunteer opportunities. • Develop and distribute an information booklet/pamphlet • Provide a list of funding and technical assistance sources.	USDA, SWCD	• Riparian landowners recognize the benefits of bioengineering techniques for streambank stabilization. • Bioengineering techniques are utilized to stabilize streambanks over hardscape armoring. • Participation in volunteer opportunities. • Requests for technical assistance with projects. • Number of stakeholders attending technical workshops. • Number of stream restoration and stabilization projects increase.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate riparian property owners on ways to improve riparian buffer conditions for water quality and habitat.	A, B & C	RR, HOA, BI, CC	• Hold riparian landowner training workshops on riparian zone management. • Publish articles in newsletters and newspapers. • Provide stream management volunteer opportunities.	USDA, SWCD	• Participation in volunteer opportunities. • Number of stakeholders attending workshops. • Requests for assistance for riparian buffer restoration projects. • Riparian landowners plant native buffers. • Riparian landowners stop dumping yard waste and other trash in the stream.
Educate landowners on lot level BMPs aimed at improving water quality and reducing stormwater	A & B	RR, HOA, BI, CC	• Hold technical sessions on the use and construction of rain gardens, rain barrels, and other lot level BMPs. • Provide detailed instructions on the construction of rain gardens and the use of rain barrels on the website. • Distribute stormwater management how-to materials for rain gardens and rain barrels.	DC, KC, DCWSC, DCCF	• Landowners voluntarily act to reduce the rate and volume of stormwater runoff from their lot. • Number of rain gardens constructed increases. • Number of rain barrels in the watershed increase.
Educate agricultural landowners on BMPs aimed at improving water quality and reducing stormwater	A & B	RR, NR	• Hold technical sessions on agricultural BMPs. • Provide information on available funding sources for the implementation of agricultural BMPs.	USDA, SWCD	• Number of agricultural BMPs increase. • Farmers voluntarily act to reduce the rate and volume of stormwater runoff from their fields.
Educate school children, adults, corporate and political entities on how to provide stewardship in the watershed.	F	All stakeholders	• Provide stewardship volunteer opportunities. • Host activities such as stream cleanups, storm drain painting, and natural area maintenance.	DCCF, DCWSC	• Number of people in the watershed aware of how their daily activities affect water quality and stream health increases. • Individuals make behavior changes to protect and improve water quality and stream health.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate students on the methods of water quality and habitat assessment and watershed planning	A, B, C, & D	S	• Provide technical assistance to the water quality and watershed planning coursework at Sycamore High School and Northern Illinois University and other partners as appropriate.	DCCF, DCWSC	• Collection of additional water quality and habitat data in the watershed. • Number of students studying environmental science and engineering increases.



0 0.5 1

Miles

1 inch = 6,500 feet

N S E W

Legend

- ★ Other Type of BMP
- 🟩 Stream Corridor Restoration
- 🟪 Stream Corridor Plan
- 🟨 Detention Basin Retrofit
- ▨ Infiltration Based BMP
- 🟦 Other Type of BMP
- ▨ Post-treatment Wetland
- 🟩 Wetland Creation/Restoration
- Rivers & Streams
- ☐ Watershed Boundary
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets
- Railroads
- ☐ County Boundary

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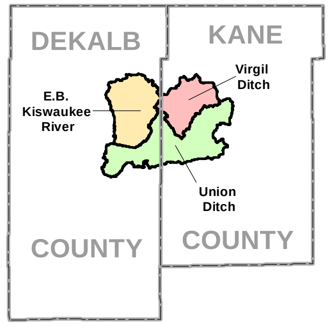
Union-Virgil Ditch Watershed Improvement Plan



5-1 - Site Specific BMP Locations

Chapter 6.0 Plan Implementation and Evaluation

This chapter identifies a strategy for moving from planning to implementation of the action plan recommendations. How frequently this plan is used and implemented by watershed stakeholders is one indicator of its success. Improvement in water quality and watershed resources, the reduction of nonpoint source pollution, and the reduction of flooding is also important indicator. Successful plan implementation will require significant cooperation and coordination among watershed stakeholders to secure project funding and to efficiently and effectively move the action plan from paper to the watershed.

This chapter also relates some more technical details about the expected results of putting action recommendations in place. It also presents a plan for monitoring and evaluating plan implementation as a way to determine progress towards meeting the watershed goals and objectives.

6.1 Plan Implementation Roles Strategy

Successful plan implementation is dependent on watershed stakeholders forming partnerships as a means of maximizing efforts to complete watershed projects. Key stakeholders that have potential to form watershed partnerships for the implementation of the watershed plan are listed in Chapter 5 Section 2. These and other stakeholders are encouraged to:

- Acquire funding through grants and other means;
- Implement educational programs;
- Sponsor and participate in water quality sampling;
- Provide technical and regulatory guidance;
- Maintain and monitor water quality improvement projects; and
- Update and amend the watershed plan as changes occur.

Throughout the planning process the DeKalb County Watershed Steering Committee (DCWSC) functioned as the stakeholder forum for the watershed. The implementation of East Branch South Branch Kishwaukee River Watershed-Based Action Plan will ultimately depend on the DCWSC continuing to serve as the lead organization focused on the implementation of the plan.

6.2 Pollutant Load Reductions and Targets

In order to meet the requirements for a watershed-based plan, the plan must pay particular attention to water quality pollutants and impairments and measures for reducing the impairment. The high priority water quality pollutants for the East Branch South Branch Kishwaukee River Watershed include low dissolved oxygen indicated by high BOD and COD and nutrients (phosphorous). Additional impairments addressed by the plan include degraded watershed aquatic habitat, impacted or lack of stream buffers and riparian zones, and flood flows and damages. See Chapter 3 for additional details on the causes and sources of water quality impairments.

For each of these impairments, the intent of the action plan recommendations is to reduce the impairment to an acceptable level. The ‘acceptable level’ for some pollutants is set by the Illinois Pollution Control Board and Illinois Environmental Protection Agency.

Setting impairment reduction targets and estimating the improvement expected by implementing plan recommendations are important for assessing the effectiveness of watershed plan recommendations for determining whether watershed impairments are being addressed. Targets and reduction estimates also satisfy one of the nine required watershed-based plan elements established by the US Environmental Protection Agency.

Targets and reduction estimates can be based on water quality criteria, data analysis, reference conditions, literature values, and/or expert examination of water quality conditions that support "Designated Uses" and biological integrity. Progress towards meeting the targets and reduction estimates indicated whether implemented BMPs are effective at achieving the watershed plan's goals. If the implemented BMPs are determined to not be making progress towards obtaining the goals, the Action Plan should be altered. Table 6-1 includes specific target values and indicators for meeting the water quality objectives developed for this watershed-based plan. Section 6.5 contains Report Cards that can be used to evaluate the effectiveness of the implemented Action Plan projects.

Table 6-1 Targets and Indicators to meet water quality objectives

Water Quality Objective	Target Value and Indicator
1) Stream shall meet state water quality standards to fully support designated uses.	• Total Suspended Solids: Less than 750 ppm (Illinois EPA standard) • Dissolved Oxygen: No less than 5 mg/L (Illinois EPA standard) • Temperature: Less than 90 degree F (Illinois EPA standard) • pH: Between 6.5 and 9 (Illinois EPA standard) • Chemical water quality standards: See Illinois EPA standards in Table 3-32 • Macroinvertebrate Biotic Index (MBI): Less than 5.7 • Public Opinion: 50% of surveyed citizens feel water quality is improving.
2) Reduce sediment and nutrient loading by protecting and restoring streambanks and stream channels using bioengineering techniques.	• Acres of riparian buffer: Riparian buffers restored on 30 acres in years 1-5, 40 acres in years 5-10, and 45 acres in years 10-15. • Acres of wetland creation/restoration: Implement wetland creation/restoration on 200 acres in years 1-5, 300 acres in years 5-10, and 500 acres in years 10-15. • Linear feet of 2-stage channels: Implement 2-stage channels on 4,000 linear feet in years 1-5, 6,000 linear feet in years 5-10, and 9,000 linear feet in years 10-15. • Linear feet of stabilized streambanks: Implement stream stabilization improvement projects: one project in years 1-5 and two projects in years 5-10 and 10-15. • Acres of bioinfilitration BMPs: Implement urban projects: one project in years 1-5 and two projects in years 5-10 and 10-15. • Macroinvertebrate Biotic Index (MBI): Less than 5.7 • Chemical water quality standards: See Illinois EPA standards in Table 3-32

Water Quality Objectives	Target Value and Indicator
3) Retrofit existing stormwater management facilities and install new facilities within developed areas to reduce nutrient and sediment loading.	• Acres of retrofits: Implement detention basin retrofits: one project in years 1-5 and two projects in years 5-10 and 10-15 • Acres of bioinfilitration BMPs: Implement urban projects: one project in years 1-5 and two projects in years 5-10 and 10-15. • Chemical water quality standards: Discharges from stormwater management facilities meet Illinois EPA standards
4) Identify open space parcels for implementation of BMPs and designed for water quality improvement and wetland creation.	• Acres of wetland creation/restoration: Implement wetland creation/restoration on 200 acres in years 1-5, 300 Acres of riparian buffer: Riparian buffers restored on 30 acres in years 1-5, 40 acres in years 5-10, and 45 acres in years 10-15. • Linear feet of stabilized streambanks: Implement stream stabilization improvement projects: one project in years 1-5 and two projects in years 5-10 and 10-15. • Retrofits: Implement detention basin retrofits: one project in years 1-5 and two projects in years 5-10 and 10-15.
5) Implement stormwater management practices to stabilize stream flows and reduce stormwater runoff entering streams.	• Flood problem areas: Implement at least two flood mitigation projects within each timeframe: 1-5 years, 5-10 years, and 10-15. • Linear feet of stabilized streambanks: Implement stream stabilization improvement projects: one project in years 1-5 and two projects in years 5-10 and 10-15. • Acres of wetland creation/restoration: Implement wetland creation/restoration on 200 acres in years 1-5, 300 Acres of riparian buffer: Riparian buffers restored on 30 acres in years 1-5, 40 acres in years 5-10, and 45 acres in years 10-15. • Retrofits: Implement detention basin retrofits: one project in years 1-5 and two projects in years 5-10 and 10-15 • New Facilities: Construct new stormwater management facilities in developed areas: one project in years 1-5 and two projects in years 5-10 and 10+
5) Educate the public about protecting and improving water quality	• Public Opinion: 50% of surveyed citizens feel water quality is improving.

6.2.1 Estimating Pollutant Load Reductions

Reducing pollutant loading in the watershed can be accomplished by the construction of new BMPs, improvements to existing pollutant control practices, and or a combination of the methods. Typically, improvements to existing practices can be implemented more quickly and at a lesser cost the construction of new BMPs. However, retrofitting existing practices alone is not efficient to reduce pollutant loads to meet the goals of the watershed-based plan. As such, new BMPs and the reduction of untreated runoff from impervious area need to be integrated into plans to reduce pollutant water in the watershed.

Pollutant load reductions are based on predicted pollutant load removal efficiencies developed by the Indiana Department Environmental Management (IDEM), Michigan Department of Environmental Quality (MDEQ), Illinois State Water Survey (ISWS), and Illinois Environmental Protection Agency (Illinois EPA). Table 6-2 includes a list of BMPs and predicted removal efficiencies. Pollutant load reductions were calculated through the use of workbook included in the "Pollutants Controlled Calculation and Documentation for Section 319 Watershed Training Manual" (Michigan Department of Environmental Quality, June 1999).

Table 6-2 BMP percent pollutant removal efficiencies

BMP	TSS	TDS	BOD	COD	TN	TKN	DP	TP	Cadmium	Lead	Copper	Zinc
Vegetated Filter Strips	73%	*	50.5%	40%	40%	*	*	45%	*	45%	*	60%
Grass Swales	65%	*	30%	25%	10%	*	*	25%	50%	70%	50%	60%
Infiltration Devices	94%	*	83%	*	*	*	*	83%	*	*	*	*
Extended Wet Detention	86%	*	72%	*	55%	*	*	68.5%	*	40%	*	20%
Wetland Detention	77.5%	*	63%	50%	20%	*	*	44%	*	65%	*	35%
Dry Detention	57.5%	*	27%	20%	30%	*	*	26%	*	50%	*	20%
Settling Basin	81.5%	*	56%	*	*	*	*	51.5%	*	*	*	*
Sand Filters	82.5%	*	40%	*	*	*	*	37.5%	*	*	*	*
Water Quality Inlets	37%	*	13%	5%	20%	*	*	9%	*	15%	*	5%
Weekly Street Sweeping	16%	*	6%	*	*	*	*	6%	*	*	*	*
Infiltration Basin	75%	*	*	65%	60%	*	*	65%	*	65%	*	65%
Infiltration Trench	75%	*	*	65%	55%	*	*	60%	*	65%	*	65%
Porous Pavement	90%	*	*	80%	85%	*	*	65%	*	1%	*	1%
Concrete Grid Pavement	90%	*	*	90%	90%	*	*	90%	*	90%	*	90%
Sand Filter/Infiltration Basin	80%	*	*	55%	35%	*	*	50%	*	60%	*	65%
WQ Inlet with Sand Filter	80%	*	*	55%	35%	*	*	*	*	80%	*	65%
Oil/Grit Separator	15%	*	*	5%	5%	*	*	5%	*	15%	*	5%
Wet Pond	60%	*	*	40%	35%	*	*	45%	*	75%	*	60%
Agricultural Filter Strip	*	*	*	*	53%	*	*	61%	*	*	*	*
Streambank Stabilization	Streambank stabilization pollutant efficiencies vary depending on bank height and lateral recession rates. The USEPA only estimates the removal of sediment, phosphorus and nitrogen from streambank stabilization.											

Pollutant Load Reductions Following the Implementation of Recommended BMPs

Table 6-3 summarizes the overall watershed load reductions associated with the implementation of the following BMPs: riparian buffers, urban BMPs (infiltration based BMPs), post treatment polishing wetlands, streambank stabilization, wetland detention basin retrofits, and creation/restoration of wetlands. Table 6-4 summarizes the overall watershed load reductions associated with the implementation of the BMPs types modeled.

Some water quality BMPs recommended in Chapter 5 were not included the load reduction calculations. These BMPs include stream corridor management programs, removal of structures in the 100-year flood plain, native vegetation, and street sweeping. Table 6-4 lists and compares additional BMPs that are designed to achieve water quality goals and standards. The table also includes a rating for each BMP that represents their effectiveness when applied to a particular land use. The ratings include High (H), Medium (M), and Low (L). Chapter 4 also includes additional information on BMPs that can be implemented in the watershed.

Table 6-3 Pollutant Load Reductions for Site Specific BMPs

BMP ID#	BMP Type	Pollutant Load Reductions (lbs/year)											
		BOD	**COD**	**TSS**	**LEAD**	**COPPER**	**ZINC**	**TDS**	**TN**	**TKN**	**DP**	**TP**	**CADMIUM**
50	Riparian Buffers	40	204	809	0	U	2	U	9	U	U	1	U
51	Infiltration-based BMP	U	1017	5508	6	U	5	U	49	U	U	6	U
54	Infiltration-based BMP	U	8538	21368	14	U	54	U	344	U	U	48	U
56	Wetland Creation	161	1190	10079	0		2		41			7	161
58	Streambank Stabilization	U	U	610.4	U	U	U	U	1220.7	U	U	610.4	U
60	Extended wetland detention	1556	7910	27061	17	U	36	U	136	U	U	40	1556
61	Infiltration-based BMP	U	1575	4661	5	U	6	U	21	U	U	3	U
62	Infiltration-based BMP	U	1348	3373	2	U	9	U	54	U	U	9	U
63	Infiltration-based BMP	U	1943	4863	3	U	12	U	78	U	U	11	U
64	Infiltration-based BMP	U	1551	3381	3	U	10	U	62	U	U	9	U
66	Riparian Buffers	61	448	4468	0	U	2	U	38	U	U	3	61
N/A	Riparian Buffers	1045	7728	770066	1	U	29	U	662	U	U	56	1045
N/A	2-Stage Channels	U	U	1292	U	U	U	U	2584	U	U	1292	U
N/A	Wetland Creation	13230	98000	830025	9	U	169	U	3360	U	U	554	U

U= Removal efficiency for the particular BMP and constituent not available.

Table 6-4 Watershed-wide Summary of BMPs

BMP Type	Unit of Measurement	Cumulative Size	Cumulative Cost	Pollutant Load Reductions (lbs/year)								
				TSS	**BOD**	**COD**	**TN**	**TP**	**Cd**	**Pb**	**Cu**	**Zn**
All BMPs	-	-		1,687,561	16,093	131,452	8,659	2,649	0	60	0	366
Riparian Buffers	Acres	122.6	$3,678,000	775,373	1,146	8,380	709	60	U	1	U	33
Infiltration-based BMP	Acres	6.77	$4,423,515	43,152	U	15,972	608	86	U	33	U	96
Wetland Creation	Acres	1,080	$10,000,000	840,104	13,391	99,190	3,401	561	U	9	U	171
Streambank Stabilization	Linear feet	8,976	$673,2000	610.4	U	U	1,221	610	U	U	U	U
Extended wetland detention	Acres	4.1	$41,000	27,061	1,556	7,910	136	40	1,556	17	U	36
2-Stage Channels	Linear feet	19,000	$4,750,000	1,292	U	U	2,584	1,292	U	U	U	U
Existing Load	-	-	-	36,181,153	583,242	2,047,671	82,616	21,472	203	732	379	3499

U= Removal efficiency for the particular BMP and constituent not available.

Table 6-5 List of urban/transitional BMPs for reducing pollutant loading

Land Use	Contaminant Reduction							Runoff Reduction	
	TSS	BOD	Oil/ Grease	Total N	Sediment	Total P	Metals	Rate	Volume
Developed Areas									
Native Landscaping	M	M	M	H	M	H	L		
Paved Area Sweeping	M	L	L	L	H	H	M		
Downspout Disconnection								L	L
Rain Gardens		L		L	L	L		M	M
Construction Sites									
Maintenance of Erosion Control	L				M		L		
Expedited Stabilization	L				H		L		
Use of Polymers	L				M	L	L		
Retrofits and New Development									
Sediment Basins	M	L	M	L	H	M	M	H	L
Swales	M	L	M	L	M	M	M	M	M
Wetland Treatment	M	M	H	H	H	M	M	H	M
Stormwater Treatment Train	H	H	H	H	H	H	H	H	M
Permeable Pavement	H	M	M	M	H	M	M	H	H
Infiltration Basins	H	H	H	H	H	H	H	H	H
Naturalized Detention	M	L	M	L	H	M	M	H	L

6.3 Plan Implementation Schedule

Watershed planning is an ongoing process that does not end with the completion of this plan. The implementation schedule acts as a guide for these future efforts by directing the priority given to the various Action Plan recommendations selected for the watershed. Higher priority or less expensive BMPs are often scheduled for implementation prior to very expensive or highly technical projects. The schedule also provides a framework for implementation by spreading out project implementation over time and allowing for reasonable timeframe for securing funding.

The Implementation Schedule for the East Branch South Branch Kishwaukee River Watershed-Based Plan is included in the Action Plan tables (Chapter 5). The Site Specific Action Plan tables include a column with a recommended implementation schedule based on short term (1-5 years), medium term (5-10 years) and long term (greater than 10 years) objectives. The tables also include a column denoting priority (low, medium, or high) of the implementation of the Action Item. In many cases implementation schedule and priority reflect higher priority items being implemented on a short term schedule and lower priority items being implemented on a long term scheduled. However, it should be noted that some high priority goals have been included as a long term goal due to the cost and technical resources required for the implementation of the project. Table 6-6presents a summary of the plan implementation schedule. The number of short, medium, and long term actions is shown to give watershed plan implementers an idea of how many actions are recommended to be implemented in each of these time frames.

Table 6-6 Plan Implementation Summary Schedule

Implementation Term	Number of Action Items
Short (1-5 years)	28
Medium (5-10 years)	24
Long (greater than 10 years)	17

6.4 Funding Sources

Plan implementation is largely based on the availability of funding and technical assistance available in the watershed for the implementation of watershed wide and site specific action items. It is no secret that securing funding is one of the biggest challenges that watershed stakeholders will face during plan implementation.

A list of potential funding sources that may be used to move forward with plan implementation is included in Table 6-7.

6.5 Plan Monitoring and Evaluation

6.5.1 Monitoring Plan Implementation

Continued monitoring is essential for providing feedback on the progress of the implementation of this watershed-based plan. The implementation and effectiveness of the plan and its recommendations, and an assessment of whether the plan goals are being achieved its measured through this monitoring. Simply, monitoring is observing and tracking watershed conditions for both positive and negative changes that are a result of the implementation of the plan. These conditions can then be compared to water quality monitoring data to determine whether there is a correlation between them. If no correlation between water quality improvement and recommendation implementation can be determined and/or is progress is not being made towards reaching the goals of the plan, DCWSC, as the implementation team, should consider whether the recommended strategies are having the desired effect or if the plan should be updated and modified.

Recommendations that are physical or structural in nature such as streambank stabilization, the construction of infiltration BMPs, and restoring riparian buffers, can be assessed in terms of the reduction of pollutant loads discharged into the watershed, improved biological and habitat health, and the degree of change in stormwater runoff volume and flow. The effectiveness of non-structural recommendations such as the implementation of education/outreach programs, stream maintenance programs, and changes to policies and regulations are much more difficult to monitor. Changes in behavior following the implementation of non-structural recommendations, can be assessed by gathering feedback through meetings with watershed stakeholders and tools such as surveys and focus groups.

Evaluation is a critical part of watershed planning. It will tell you whether or not your efforts are successful and provide a feedback loop for improving project implementation. A well-planned milestone and evaluation process will provide a way to measure the effectiveness of the watershed-based plan. As projects are implementation and results are demonstrated, additional support from the community will be gained and the likelihood of project sustainability will be greatly increased

The goal of the East Branch South Branch Kishwaukee River Watershed-Based Plan's evaluation process is to not turn evaluation and monitoring into an academic process. This monitoring strategy is intended to help track and measure the implementation of recommendations made in this plan using a variety of indicators that are monitored regularly, typically on an annual basis or every three years. Progress on overall plan implementation should be reviewed using the milestones and indicators every 5 years and the plan should be updated as needed. As a means of facilitating plan evaluation, "Report Cards" were developed for each watershed goals (Chapter 2). The report cards are intended to provide a brief description of current conditions, suggest performance indicators that should be evaluated and monitored, milestone to be met, and remedial actions if milestones are not being met.

As water quality is one of the primary goals of this plan, stream and lake water quality impairments should be monitored by regularly collecting and testing water samples, either manually or using constant monitoring equipment. A recommended sampling program for the watershed was included in Chapter 5, Section 5.4.

Watershed issues, opportunities, and conditions will change over time. This watershed-based plan should be evaluated and updated every five years to account for these changes. At each evaluation and update, completed projects can be removed from the plan and new projects should be added. In addition to this 5-year update, plan implementation should be monitored annually by the DeKalb County Watershed Steering Committee (DCWSC). At the time of the annual evaluation, the committee should assess the list of priorities and identify the top priority actions for the following year.

As projects are implemented, they should be recorded using the Report Cards and the tables in Chapter 5 which track the implementation of actions against the watershed plan goals and objectives as a means of monitoring watershed plan implementation.

Table 6-7 Potential Funding Sources

Program	Funding Agency	Type	Funding Amount	Eligibility	Activities Funded	Website/Contact
Water Quality						
Core Grants	Grand Victoria Foundation	Grant		Not-for-profit groups	Supports land use policies and practices that enhance economic vitality and promote land and water health; the development and implementation of conservation and stewardship plans to enhance ecosystem services; policies and practices that result in clean air.	http://www.grandvictoriafdn.org/grant-programs/guidelines/core-grants
Kane County Riverboat Fund Program	Kane County	Grant		Not-for-profit groups, local governments	Programs and projects that address a broad spectrum of environmental issues.	http://www.countyofkane.org/Pages/kcci/rfp.aspx
Water Quality Cooperative Agreement	USEPA	Grant (no match required but 5% match is encouraged)	$30,000-$400,000	State agencies, not-for profits, organizations, and individuals	Research, investigations, experiments, training, environmental technology demonstrations, surveys, and studies related to the causes, effects, extent, and prevention of pollution.	http://water.epa.gov/grants_funding/cwf/waterquality.cfm
Capitalization Grants for Clean Water State Revolving Funds	USEPA/Office of Wastewater Management	Loan revolving fund	No limit on wastewater funds. Drinking water up to 25% of available funds.	Local governments, individuals, citizen groups, not-for-profit groups	Wastewater treatment; NPS pollution control; watershed management; restoration &protection of groundwater; wetland/riparian zones; and habitat	www.epa.gov/owm/cwfinance/index.htm
Non-point Source Management Program (Section 319)	IEPA	Matching grant (up to 60% funded)	No set limit on awards.	Local governments, businesses, individuals, citizen and environmental groups	Controlling or eliminating NPS; streambank restoration; BMPs; and watershed planning	www.epa.state.il.us/water/financial-assistance/non-point.html
Illinois Green Infrastructure Grant Program for Stormwater Management	IEPA	Matching Grant (minimum local match for CSO projects - 15%, retention and infiltration projects and green infrastructure small projects- 25%)	Up to CSO $3M or 85% of project costs; retention and infiltration: $750,000 or 75% of project costs; green infrastructure small projects: $75,000 or 75% of project costs	Local governments, individuals, citizen groups, not-for-profit groups	Green infrastructure BMPs for stormwater management to protect or improve water quality	www.epa.state.il.us/water/financial-assistance/igig.html

Program	**Funding Agency**	**Type**	**Funding Amount**	**Eligibility**	**Activities Funded**	**Website/Contact**
Water Quality						
Water Revolving Loan Fund: Wastewater and Drinking Water	IEPA	Loan revolving fund	$25M for water pollution control loan program and $15M for public water supply load program	Local governments	Construction of wastewater or community water supply facilities	http://www.epa.state.il.us/water/financial-assistance/state-revolvin fund.html
Illinois Clean Lakes Program	IEPA	Matching grant (minimum local match of 40% for Phase I and 50% for Phase II)	No set limit on awards.	Landowners, citizen groups, and lake owners	Lake Management Plans (Phase I) and project implementation (Phase II)	http://www.epa.state.il.us/water/conservation/iclp.html
Lake Education Assistance Program	IEPA	Grant	$500	Educational institutions and not-for-profit groups	Lake and lake watershed educational programs including field trips and seminars	http://www.epa.state.il.us/water/conservation/leap.html
Streambank Cleanup and Lakeshore Enhancement	IEPA	Grant	Up to $3,500	Citizen groups, and not-for profit groups	Implementation of a streambank or lakeshore cleanup event	http://www.epa.state.il.us/water/watershed/scale.html
Sustainable Agriculture Grant Program	Illinois Department of Agriculture (IDOA)	Matching grant (up to 60% funded)		Local governments, educational institutions, not-for-profit groups, individuals, organizations	Practices aimed at maintaining producers' profitability while conserving soil, protecting water resources and controlling pests through means that are not harmful to natural systems, farmers, or consumers	www.agr.state.il.us/C2000/index.html
Private Waters Program	IDNR	Technical Assistance		Local governments, educational institutions, not-for-profit groups, individuals, organizations	Field inspections and technical advice on fish habitat, fish population management, water quality, vegetation control, streambank stabilization, and habitat development.	http://www.dnr.state.il.us/orep/pfc/incentives.htm#PWP
Streambank Stabilization and Restoration Program	IDOA	Matching grant		Landowners, citizen groups, and not-for profit groups	Naturalized streambank stabilization in rural and urban communities with SWCD	www.agr.state.il.us/C2000/index.html
Conservation Innovation Grants	NRCS	Matching grant (up to 50% funded)	Up to $75,000	Landowners, organizations	Projects targeting innovative on-the ground conservation including pilot projects and field demonstrations	www.il.nrcs.usda.gov/program/cig

Program	Funding Agency	Type	Funding Amount	Eligibility	Activities Funded	Website/Contact
Water Quality						
US EPA Green Infrastructure Technical Assistance Program	USEPA	Grant	$400,000 total funds available. Grants typically $60,000	Local governments	Technical assistance projects focused on green infrastructure implementation. These technical assistance projects are intended to address significant technical, regulatory, and institutional barriers to green infrastructure, and to build community capacity by sharing lessons learned.	http://water.epa.gov/infrastructure/greeninfrastructure/gi_support
Habitat						
Continuing Authorities Program (Section 206 Water Resources Development Act)	US ACOE	Cost-share (35% non-federal funds required)	up to $5M	Local governments	Feasibility studies, planning, engineering, construction, administration, and supervision	http://www.mvr.usace.army.mil/
Project Modifications for Improvement of the Environment (Section 1135)	US ACOE	Cost-share (25% non-federal funds required)	up to $5M	Local governments	Feasibility studies, planning, engineering, construction and supervision	http://www.mvr.usace.army.mil/
Partners for Fish and Wildlife Habitat Restoration Program	US Fish and Wildlife Service	Cost-share (50% funded)	Up to $25,000	Landowners	Restoration of native habitats for fish and wildlife, restoration of former wetlands, native prairie streams, and riparian areas	www.fws.gov/policy/640fw1.html
Flexible Funds	US FWS	Grant, Matching grant (at least 50% funded is preferred)		Landowners	Projects on private lands aimed at restoring and/or protecting wildlife habitat.	www.fws.gov
Wildlife Habitat Incentives Program	US DOA	Grant, Matching grant (at least 75% funded)		Landowners and not-for-profit groups	Establishment and improvement of fish and wildlife habitat on private land	www.nrcs.usda.gov/programs/whip
Conservation 2000-Ecosystem Program	IDNR	Matching grant		Partnerships of governments, not-for-profits, citizen groups, and private landowners	Provides funding for partnership projects that maintain and enhance ecological and economic conditions. Projects include resource economics, habitat, outreach, or capital.	http://dnr.state.il.us/orep/pfc/
Bring Back the Natives Grant Program	National Fish and Wildlife Foundation	Matching grant (33% funded)	$50,000-$75,000	Local governments, educational institutions and not-for-profit groups	Restoration of damaged and degraded riverine habitat and native aquatic species through watershed restoration and land management	www.nfwf.org
Native Plant Conservation Initiative	National Fish and Wildlife Foundation	Matching grant (50% funded)	$10,000-$50,000	Local governments, conservation districts, educational institutions and not-for-profit groups	On-the-ground projects that involve local communities and citizen volunteers in the restoration of native plant communities	www.nfwf.org

Program	Funding Agency	Type	Funding Amount	Eligibility	Activities Funded	Website/Contact
Water Quality						
Matching Aid to Restore State Habitats (MARSH) Program	Ducks Unlimited	Matching grant (50% funded)		Local governments, individuals, citizen groups, not-for-profit groups	Restore and enhance wetland habitat for waterfowl conservation	www.ducks.org
Watershed Assistance Grants Program	River Network	Grant	$4,000-$30,000	Local governments, individuals, citizen groups, not-for-profit groups	Community-based partnerships that conserve or restore watershed	http://www.rivernetwork.org/resource-library/watershed-assistance grant-program-now-open
Wildlife						
Waterfowl Production Areas	US FWS	Grant		Local governments, citizen groups, not-for-profit groups	Acquisition of 100-acre or larger existing or restorable wetlands open to hunting, fishing, and trapping.	www.fws.gov
Private Stewardship Grants Program	US FWS	Matching grant (90% funded)		Landowners	Provides for the implementation of conservation practices on private land that benefit federally listed, proposed, or candidate species.	www.fws.gov
Division of Wildlife Resources Special Funds Application (Habitat, Furbearer, and Pheasant Funds)	IDNR	Cost-share preferred but not required		Local governments, individuals, citizen groups, not-for-profit groups	Habitat improvement or land acquisition funded by the Habitat Fund, Furbearer Fund, and Pheasant Fund. Projects must preserve, protect, acquire, or manage wildlife for future generations.	http://www.dnr.state.il.us/grants/special_funds/wildgrant.htm
Illinois Migratory Waterfowl Stamp Fund	IDNR	Cost-share preferred but not required		Local governments, individuals, citizen groups, not-for-profit groups	Provides for the acquisition of public lands and/or the development of habitat to attract and support waterfowl	http://www.dnr.state.il.us/grants/special_funds/wildgrant.htm
Illinois Wildlife Preservation Fund	IDNR	Cost-share preferred but not required	$2,000	Local governments, individuals, citizen groups, not-for-profit groups	Management, site inventories and educational programs designed to preserve, protect, and enhance non-game wildlife and native plant species.	http://www.dnr.state.il.us/grants/special_funds/wildgrant.htm
Illinois Acres for Wildlife	IDNR	Technical Assistance and Materials		Private Landowners	Provides technical assistance and materials (tree seed or seedling) for protection of 1 acre of land for a minimum of 1 year for wildlife.	http://dnr.state.il.us/orc/Wildliferesources/AFW/
Private Land Wildlife Habitat Management Fund	IDNR	Technical Assistance		Landowners (0.25 acres in urban areas and 1 acre in rural areas)	Technical assistance program that provides landowners plans, field equipment, plant materials, and labor to develop, implement, and maintain wildlife habitat management practices	http://www.dnr.state.il.us/orep/pfc/incentives.htm

Program	Funding Agency	Type	Funding Amount	Eligibility	Activities Funded	Website/Contact
Water Quality						
Trees, Shrubs, and Seedlings at No Cost Program	IDNR	Materials		Landowners with IDNR approved management plan	Provides seedlings at no cost as a means of increasing wildlife habitat and erosion control by reforesting land.	http://www.dnr.state.il.us/orep/pfc/incentives.htm
Challenge Grants	National Fish and Wildlife Foundation	Matching grant (50% funded)		Partnerships of governments, not-for-profits, citizen groups, and private landowners	Natural resource conservation projects including wetland conservation, conservation education, fisheries, migratory bird conservation, conservation policy, and wildlife habitat	www.nfwf.org
Wildlife Links	National Fish and Wildlife Foundation	Grant	$25,000	Golf courses	Funds cutting edge research, management and educational projects to help golf courses become a part of the conservation landscape.	www.nfwf.org
Wetlands						
Wetland Reserve Program	USDA NRCS	Direct contracts with landowner; Easement (100%); Cost-share and 30-year easement (75%)	No set limit on awards.	Individuals, citizen groups, and not-for-profits	Wetland restoration or protection through easement and restoration agreement	www.nrcs.usda.gov/programs/wrp/states/il.html
Wetlands Program Development Grants	US EPA	Matching grant (75% funded)	No set limit on awards.	Local governments, not-for-profit groups	Development of a comprehensive monitoring and assessment program; refining the protection of vulnerable wetlands and aquatic resources	www.epa.gov/owow/wetlands/grantguidelines
North American Wetland Conservation Act	US FWS	Matching grant (50% funded)	$50,000	Partnerships of governments, not-for-profits, citizen groups, and private landowners	Projects including acquisition, restoration, creation and/or enhancement of wetlands and wetland-associated uplands	http://www.fws.gov/birdhabitat/Grants/NAWCA/index.shtm
Small Grants Program	North American Wetlands Conservation Council	Matching grant	Up to $75,000	Partnerships of governments, not-for-profits, citizen groups, and private landowners	Long-term acquisition, restoration, and enhancement of natural wetlands	www.fws.gov/birdhabitat.grants/NAWCA/index.shtm
Five Star Restoration Program	National Fish and Wildlife Foundation	Matching grant (50% funded)	$10,000-$25,000 (one year projects); $10,000-$40,000 (two year projects)	Any entity that can receive grants	Seeks to develop a community capacity to sustain local resources for future generations by providing financial assistance to diverse partnerships for wetland and riparian habitat restoration	www.nfwf.org

Program	Funding Agency	Type	Funding Amount	Eligibility	Activities Funded	Website/Contact
Water Quality						
Education						
Environmental Education Grants	US EPA	Matching grant (75% funded)		Local governments, educational institutions and not-for-profit groups	Environmental educational activities such as curricula development, designing or demonstrating educational field methods, and training educators	http://www2.epa.gov/education/environmental-education-ee-grant
Urban and Community Forestry Grant Program	IDNR	Matching grant (50% funded)		Local governments or partnership between a local government and a not-for-profit group	To create or enhance a local forestry program in communities with a local forestry ordinance	http://www.dnr.state.il.us/orc/urbanforestry/financialasst.html
Flood Control						
Office of Water Resources Small Project Fund	IDNR	Grant	up to $75,000	Smaller urban and rural communities	To reduce stormwater related damage by alleviating local significant drainage and flood problems.	http://www.dnr.illinois.gov/WaterResources/Pages/Programs.aspx
Hazard Mitigation Grant Program	IEMA/FEMA	Matching grant (75% funded)		State and local governments and not-for-profits in communities in good standing with the National Flood Insurance Program	Provides funds for long-term hazard mitigation measures after a major disaster declaration. Traditionally has funded acquisition or elevation of flood damaged buildings.	http://www.state.il.us/iema/planning/MitigationPrograms.asp
Flood Mitigation Assistance Program	IEMA/FEMA	Matching grant (75% funded)		Communities in good standing with the National Flood Insurance Program and have an approved flood mitigation plan	Provides funds for cost-effective measures to reduce flood damage to structures with flood insurance.	http://www.state.il.us/iema/planning/MitigationPrograms.asp
Pre-Disaster Mitigation Plan	IEMA/FEMA	Matching grant (75% funded)		Communities in good standing with the National Flood Insurance Program and have an approved flood mitigation plan	Funds the development of an all-hazards mitigation plan or for a cost-effective mitigation project.	http://www.state.il.us/iema/planning/MitigationPrograms.asp
Severe Repetitive Loss Program	IEMA/FEMA	Matching grant (90% funded)		Owners of residential properties covered under NFIP insurance and is considered to be "SRL"	Funds the acquisition and relocation of at risk structures and the conversion of the land to open space. It may also fund minor localized flood reduction projects.	http://www.state.il.us/iema/planning/MitigationPrograms.asp

Program	**Funding Agency**	**Type**	**Funding Amount**	**Eligibility**	**Activities Funded**	**Website/Contact**
Water Quality						
Open Space Preservation/Management Acquisition						
Vital Illinois Lands	Grand Victoria Foundation	Matching grant (30% funded)		Not-for-profit groups	Funds to ensure the permanent protection and long-term stewardship of Illinois' most vital lands and build support for projects and conservation among public, private, and nonprofit organizations, other potential donors, and the broader public.	http://www.grandvictoriafdn.org/grant-programs/guidelines/vital-lands-illinois
Forestry Development Program	IDNR	Cost-share (75% funded)		Landowners with 5 contiguous acres. Forest must be 100 ft wide	Provides funding for tree planting, site preparation, vegetation control, fire break, fencing, and thinning and pruning. Land must have a Forest Management Plan.	http://www.dnr.illinois.gov/Grants/Pages/default.aspx
Land and Water Conservation Fund (LWCF)	IDNR	Matching grant (50% funded)	$750,000 for land acquisition and $400,000 for development/renovation project	Local governments	Provides funding for the acquisition and development of public parks and open space.	http://www.dnr.state.il.us/ocd/newoslad1.htm
Open Space Acquisition and Development Program (OSLAD)	IDNR	Matching grant (50% funded)	$750,000 for land acquisition and $400,000 for development/renovation project	Local governments	Provides funding for the acquisition and development of public parks and open space.	http://www.dnr.state.il.us/ocd/newoslad1.htm
Open Land Trust Grant	IDNR	Program not funded since 2003		Local governments	Funds land acquisition for open space and resource based outdoor recreation.	http://www.dnr.state.il.us/ocd/newolt2.htm
Urban and Community Forestry	US FS	Technical Assistance		Local governments and private sector	Provides technical assistance to improve natural resource management of forested lands and open spaces in urban settings.	http://www.fs.fed.us/ucf/
Recreation						
Illinois Bicycle Grant Program	IDNR	Matching grant (50% funded)		Local governments	Funds acquisition, construction and rehabilitation of bicycle paths.	http://www.dnr.state.il.us/ocd/newbike2.htm
Illinois Trails Grant Program	IDNR	Matching grant (50% funded)			Funds acquisition, construction and maintenance of public recreation paths.	http://www.dnr.state.il.us/ocd/newtrail2.htm
Recreation Trails Program	Federal Government	Matching grant (80% funded (non-federal funds)		Federal, state, and local governments and not-for-profits	Funds acquisition, construction, rehabilitation and maintenance of public motorized and non-motorized recreational trails	http://www.dnr.state.il.us/ocd/newrtp2.htm
Snowmobile Grants	IDNR	Matching grant (50% for construction, 90% for acquisition)			Funds acquisition, development and rehabilitation of public snowmobile areas, trails, and facilities.	http://dnr.state.il.us/ocd/newsnow2.htm

Program	**Funding Agency**	**Type**	**Funding Amount**	**Eligibility**	**Activities Funded**	**Website/Contact**
Water Quality						
Off Highway Vehicle Recreation Trails	IDNR	Up to 100% funding			Funds acquisition, construction, rehabilitation, and design of OHV trails. Also provides funding for rider education and safety programs and facility security.	http://www.dnr.state.il.us/ocd/newohv2.htm
Rivers, Trails, and Conservation Assistance Program	National Park Service			Local governments	Provides technical assistance to help communities achieve conservation objectives.	http://www.nps.gov/ncrc/programs/rtca/index.htm
TEA-21 Enhancement Program	IDOT	Matching grant (80% for construction, 50% for acquisition)		Transportation agencies	Provides funding for projects that support alternative modes of transportation, preservation of visual and cultural resources, and landscape beautification.	http://www.dot.state.il.us/opp/overview.html
Agriculture						
Sustainable Agriculture (C2000)	IDOA	Matching grant		Local governments, corporations, not-for-profits, and private landowners	Provides funding for the implementation of sustainable agricultural practices.	http://www.agr.state.il.us/C2000/index.html
Conservation Reserve Program (CRP)	USDA FSA	Rent payment		Private Landowners	Farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality.	http://www.fsa.usda.gov/FSA/il
Air Quality						
Congestion Mitigation and Air Quality Improvement (CMAQ) Program	FHWA	Grant		Transportation agencies in areas in nonattainment or maintenance for ozone, carbon monoxide, and/or particulate matter.	Support surface transportation projects and other related efforts that contribute air quality improvements and provide congestion relief with an emphasis on diesel engine retrofits and other efforts that underscore the priority on reducing fine particle pollution.	http://www.fhwa.dot.gov/environment/air_quality/cmaq/

Goal A: Protect and enhance overall surface and groundwater quality in the East Branch South Branch Kishwaukee River Watershed

Current Conditions and Problems:

- Water quality modeling indicates that predicted levels of total suspended solids, phosphorus, COD, and BOD are above state standards.
- Low dissolved oxygen levels and elevated levels of nitrogen may also be potential water quality impairments.
- Hydromodification and channelization are prevalent throughout the watershed.
- Very limited water quality and habitat data is available for the watershed.

Indicators to Meet Objectives:

- Chemical water quality parameters (nutrients, metals, etc) meet Illinois EPA standards for designated use of the waterbody.
- All physical water quality parameters (DO, pH, TSS, etc) meet Illinois EPA standards.
- Acres of riparian buffers.
- Linear feet of 2-stage channels.
- Linear feet of streambank stabilization.
- Acres of urban BMPs to improve water quality.
- Acres of wetland creation/restoration.
- Percentage of surveyed citizens who feel water quality is improving, are able to identify where water pollution originates, and are able to identify methods of protecting and restoring water quality.

Milestones:	Grade
1-5 Years: 1. Establish and fund a water quality monitoring program. 2. Restore 30 acres of riparian buffers. 3. Implement 2-stage channels on 4,000 linear feet of stream/ditch. 4. Implement wetland creation/restoration on 200 acres. 5. Develop stream restoration concept plans for at least one stream reach. 6. Implement at least one urban BMP project.	
5-10 Years 1. Implement the water quality monitoring program. 2. Restore 40 acres of riparian buffers. 3. Implement 2-stage channels on 6,000 linear feet of stream/ditch. 4. Implement wetland creation/restoration on 300 acres. 5. Implement at least one stream stabilization project. 6. Implement at least two urban BMP project.	

10-15 Years

1. Restore 45 acres of riparian buffers.
2. Implement 2-stage channels on 9,000 linear feet of stream/ditch.
3. Implement wetland creation/restoration on 500 acres.
4. Implement at least two stream stabilization project.
5. Implement at least two urban BMP project.
6. Results of survey posted to the WSC or KREP website indicate that at least 50% of the watershed stakeholders feel that water quality is improving and is able to identify sources of pollution and methods to protect water quality.

Monitoring Needs/Efforts:

- Regular monitoring of physical, chemical, and biological water quality parameters.
- Track the number of acres where riparian buffers are established. Periodically visit riparian buffer projects to assess for proper maintenance and management.
- Track the acres of wetland creation/restoration. Periodically visit wetland creation/ restoration projects to assess function and success.
- Track the number (linear feet) of 2-stage channel projects in the watershed.
- Track the number (linear feet) of stream stabilization projects in the watershed.
- Track the number of retrofit stormwater BMPs constructed.

Remedial Actions:

- Assess the number of projects that have been implemented versus water quality changes to determine if projects are improving water and habitat quality. If not, conduct an assessment to find causes of pollution and address.
- If riparian buffers, 2-stage channel installations, and stabilization projects do not improve instream and streamside habitat, determine if hydraulic problems upstream or downstream are damaging the project and/or conduct remedial work such as re-seeding or habitat installation.

Notes:

Grade Evaluation:
A = Met or exceeded milestone(s)
B = Milestone(s) 75% achieved
C = Milestone(s) 50% achieved
D = Milestone(s) 25% achieved
F = Milestone(s) not achieved

<table>
<tr><td colspan="2">**Goal B: Reduce existing flood damage in the watershed and prevent flooding from worsening**</td></tr>
<tr><td colspan="2">**Current Conditions and Problems:**
• The installation of drain tiles and urbanization has drastically altered the historic hydrology in the watershed.
• The changes in hydrology have lead to changes in stream function and decreased in infiltration.
• Current flooding in the watershed includes: overbank flooding, local drainage problems, and depressional flooding.</td></tr>
<tr><td colspan="2">**Indicators to Meet Objectives:**
• Number of flood problem areas that are mitigated or reduced by BMP implementation.
• Number of structures removed or protected from flooding within the floodplain boundaries.
• Number of stream restoration projects that reconnect the stream channel to the floodplain.
• Number of existing developments that implement flood reduction BMPs.
• Number of stream corridor management programs.
• Acres of urban BMPs
• Acres of wetland creation/restoration.</td></tr>
<tr><td>**Milestones:**
1-5 Years
1. Secure funding for and complete a Stormwater Management Plan including a detailed H&H study of the watershed.
2. Develop stream stabilization concept plans for at least one stream reach.
3. Conduct a detention basin inventory.
4. All new or re-development incorporate infiltration BMPs.
5. Implement a stream corridor management program to clear streams channels of problematic debris jams in at least two stream reaches.
6. Implement at least one stream project where the stream is reconnected to the floodplain.
7. Implement wetland creation/restoration on 200 acres.
8. Remove the Evergreen Mobile Home Park from the 100-year floodplain.</td><td>Grade</td></tr>
<tr><td>5-10 Years
1. Identify and protect at least two parcels located in the 100-year floodplain.
2. Implement a stream corridor management program to clear streams channels of problematic debris jams in at least two stream reaches.
3. Implement at least one streambank stabilization projects.
4. Implement at least one stream project where the stream is reconnected to the floodplain.
5. Retrofit at least one older developments with urban BMPs.
6. Implement wetland creation/restoration on 300 acres.</td><td></td></tr>
</table>

10-15 Years

1. Identify and protect at least 2 parcels located in the 100-year floodplain.
2. Implement a stream corridor management program to clear streams channels of problematic debris jams in at least two stream reaches.
3. Implement at least one streambank stabilization project.
4. Implement at least one stream project where the stream is reconnected to the floodplain.
5. Retrofit at least two older developments with urban BMPs.
6. Implement wetland creation/restoration on 500 acres.

Monitoring Needs/Efforts:

- Track the number of mitigated/reduced flood problem areas.
- Track the linear feet of stream projects that reconnect the stream channel to the floodplain.
- Track the number of stream reaches where problematic debris jams or culverts are repaired.
- Track the acres of urban BMPs installed in older developments.
- Track the acres of wetland creation/restoration. Periodically visit wetland creation/ restoration projects to assess function and success.

Remedial Actions:

- Conduct follow-up visits to flood problem areas during flood events to determine if additional work is needed.
- Conduct an inventory of detention basins to determine if retrofits are possible.

Notes:

Grade Evaluation:
A = Met or exceeded milestone(s)
B = Milestone(s) 75% achieved
C = Milestone(s) 50% achieved
D = Milestone(s) 25% achieved
F = Milestone(s) not achieved

Goal C: Improve aquatic and wildlife habitat in the East Branch South Branch Kishwaukee River watershed.

Current Conditions and Problems:

- Vegetation along the creek channels is not diverse and is dominated agricultural fields.
- There are very few natural stream features (pools, riffles, etc) present in the watershed's creeks.
- Hydromodification including channelization and streambank erosion is present in the watershed.

Indicators to Meet Objectives:

- Acres of riparian buffers.
- Linear feet of 2-stage channels.
- Linear feet of streambank stabilization.
- Acres of wetland creation/restoration.
- Percentage of surveyed citizens who feel water quality is improving, are able to identify where water pollution originates, and are able to identify methods of protecting and restoring water quality. Number of stakeholder landscapes that incorporate native vegetation.

Milestones:

Grade

1-5 Years

1. Restore 30 acres of riparian buffers.
2. Implement 2-stage channels on 4,000 linear feet of stream/ditch.
3. Implement wetland creation/restoration on 200 acres.
4. Develop stream restoration concept plans for at least one stream reach.
5. At least ten watershed stakeholders (private residents, business owners, etc) incorporate native vegetation into existing landscapes.

5-10 Years

1. Restore 40 acres of riparian buffers.
2. Implement 2-stage channels on 6,000 linear feet of stream/ditch.
3. Implement wetland creation/restoration on 300 acres.
4. Implement at least one stream stabilization project.
5. Implement at least two stream restoration projects in the watershed.
6. Conduct at least one detention basin retrofits where turf grass basins are converted into native vegetation.
7. At least twenty watershed stakeholders (private residents, business owners, etc) incorporate native vegetation into existing landscapes.

10-15 Years

1. Restore 45 acres of riparian buffers.
2. Implement 2-stage channels on 9,000 linear feet of stream/ditch.
3. Implement wetland creation/restoration on 500 acres.
4. Implement at least two stream stabilization project.
5. Conduct at least one detention basin retrofits where turf grass basins are converted into native vegetation.
6. At least 15% of watershed stakeholders (private residents, business owners, etc) incorporate native vegetation into existing landscapes.

Monitoring Needs/Efforts:

- Track the number of acres where riparian buffers are established. Periodically visit riparian buffer projects to assess for proper maintenance and management.
- Track the acres of wetland creation/restoration. Periodically visit wetland creation/ restoration projects to assess function and success.
- Track the number (linear feet) of 2-stage channel projects in the watershed.
- Track the number (linear feet) of stream stabilization projects in the watershed.
- Track the number of stakeholders that incorporate native plants into landscapes each year.

Remedial Actions:

- If stream and wetland restoration projects are failing, conduct remedial work such as re-seeding and habitat installation.
- If the buffer and native grass installation milestones cannot be met, reduce the number to more feasible goals.

Notes:

Grade Evaluation:
A = Met or exceeded milestone(s)
B = Milestone(s) 75% achieved
C = Milestone(s) 50% achieved
D = Milestone(s) 25% achieved
F = Milestone(s) not achieved

Goal D: Develop open space in the East Branch South Branch Kishwaukee River watershed and provide recreational opportunities	
Current Conditions and Problems: • The pre-settlement landscape consisting mostly of savanna, marsh, and prairie communities has been significantly altered by agriculture and urbanization. • Very few parcels of protected open space are preserved in the watershed.	
Indicators to Meet Objectives: • Acres of riparian buffers. • Acres of wetland creation/restoration. • Number of new development that is designed to include and protect open space. • Number of linear feet of new trail constructed in the watershed as part of the DeKalb County Greenway and Trails Plan and the Kane County 2040 Green Infrastructure Plan.	
Milestones: 1-5 Years 1. Restore 30 acres of riparian buffers. 2. Implement wetland creation/restoration on 200 acres. 3. Conduct at least one seminar for developments on methods to integrate open space into residential and commercial development. 4. All municipalities incorporate the recommendations of the DeKalb County Greenway and Trails Plan and/or the Kane County 2040 Green Infrastructure Plan into their comprehensive plans. 5. Construction of at least one segment of trail included on the DeKalb County Greenway and Trails Plan and/or the Kane County 2040 Green Infrastructure Plan.	Grade
5-10 Years 1. Restore 40 acres of riparian buffers. 2. Implement wetland creation/restoration on 300 acres. 3. Conduct at least one seminar for developments on methods to integrate open space into residential and commercial development. 4. Construction of at least one segment of trail included on the DeKalb County Greenway and Trails Plan and/or the Kane County 2040 Green Infrastructure Plan.	
10-15 Years 1. Restore 45 acres of riparian buffers. 2. Implement wetland creation/restoration on 500 acres. 3. At least one new development constructed designed to include and protect open space. 4. Complete a Natural Areas Management Plan for all park and open space in the watershed. 5. Completion of the trails included on the DeKalb County Greenway and Trails Plan and/or the Kane County 2040 Green Infrastructure Plan	

Monitoring Needs/Efforts:

- Track the number of acres of riparian buffers established. Periodically visit riparian buffer projects to assess for proper maintenance and management.
- Track the acres of wetland creation/restoration. Periodically visit wetland creation/ restoration projects to assess function and success.
- Track the linear feet of new trails constructed.
- Track the number of developments that are designed to include and protect open space.

Remedial Actions:

- Reassess municipal budgets for open space protection efforts.
- Apply for grant monies for the acquisition of additional open space.
- Apply for grant monies for the preparation of a Natural Areas Management Plan.

Notes:

Grade Evaluation:
A = Met or exceeded milestone(s)
B = Milestone(s) 75% achieved
C = Milestone(s) 50% achieved
D = Milestone(s) 25% achieved
F = Milestone(s) not achieved

Goal E: Increase coordination between decision makers and other stakeholders in the watershed.

Current Conditions and Problems:

- A limited number of stakeholders are currently working together to pursue grant funds to implement watershed improvement projects.
- Municipal decisions-makers need to work together to develop beneficial multi-jurisdictional partnerships related to funding, technical assistance, grant proposals, and open space/greenway protection.

Indicators to Meet Objectives:

- Number of municipalities in the watershed that adopt the watershed-based plan.
- Number of municipalities and stakeholders that participate in WSC activities.
- Number of municipalities that implement Action Items.
- Number of municipalities that adopt comprehensive plan, codes, and ordinances that support the recommendations of the watershed-based plan.

Milestones:	Grade
1-5 Years 1. WSC to hold a minimum of four meetings per year to discuss plan recommendations and track plan implementation. 2. All municipalities adopt the watershed-based plan and implement changes to plans, codes, and ordinances that support plan recommendations. 3. Representatives from all municipalities and other stakeholders attend the WSC meetings. 4. At least two multi-jurisdictional and/or public-private Action Items are implemented. 5. At least two municipalities adopted the Regulatory Recommendations outlined in the Watershed Plan.	
5-10 Years 1. WSC to hold a minimum of four meetings per year to discuss plan recommendations and track plan implementation. 2. Representatives from all municipalities and other stakeholders attend the WSC meetings. 3. At least two multi-jurisdictional and/or public-private Action Items are implemented. One of the two projects should be a site specific Action Item. 4. At least two municipalities adopted the Regulatory Recommendations outlined in the Watershed Plan.	
10-15 Years 1. WSC to hold a minimum of four meetings per year to discuss plan recommendations and track plan implementation. 2. Representatives from all municipalities and other stakeholders attend the WSC meetings. 3. At least two multi-jurisdictional and/or public-private Action Items are implemented. One of the two projects should be a site specific Action Item. 4. The remaining municipalities adopted the Regulatory Recommendations outlined in the Watershed Plan.	

Monitoring Needs/Efforts:

- Track number of WSC meetings and what was discussed.
- Track the number of municipalities in the watershed that adopt the watershed-based plan.
- Track the number of Action Items implemented by municipalities.

Remedial Actions:

- WSC encourage government officials to adopt the watershed-based plan if not adopted in years 1-5.
- WSC to meet with government officials to discuss Action Items that have not been implemented.

Notes:

Grade Evaluation:
A = Met or exceeded milestone(s)
B = Milestone(s) 75% achieved
C = Milestone(s) 50% achieved
D = Milestone(s) 25% achieved
F = Milestone(s) not achieved

Goal F: Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

Current Conditions and Problems:

- DeKalb Community Foundation has done a wonderful job of leading the education process through plan development, however, education is an ongoing process.
- Education on stream maintenance and water quality and habitat improvements is needed for residents living in the watershed.

Indicators to Meet Objectives:

- Number of members of KREP.
- Number of seminars or workshops related to general water quality.
- Number of seminars or workshops related to educating the public on riparian management including debris removals and streambank stabilization.
- Number of seminars or workshops related to the native plants and natural area restoration.
- Number of seminars or workshops on agricultural BMPs.
- Attendance at seminars and workshops.
- Number of publicized watershed improvement projects in the new media, newsletters, websites, etc.
- Number of homeowners associations (HOA) programs related to water quality and stream maintenance.

Milestones:

Grade

1-5 Years

1. Maintain watershed website.
2. Conduct at least 1 seminar related to benefits of native plants and natural area restoration and track attendance and track attendance.
3. Conduct at least 1 seminar related to agricultural BMPs and track attendance.
4. Conduct at least 2 seminars related to water quality and riparian management and track attendance.
5. Publicize all watershed improvement projects in the news media, newsletters, websites, etc.
6. Identify at least 1 HOA interesting in hosting an educational program.

5-10 Years

1. Maintain watershed website.
2. Conduct at least 1 seminar related to benefits of native plants and natural area restoration and track attendance.
3. Conduct at least 1 seminar related to agricultural BMPs and track attendance.
4. Conduct at least 2 seminars related to water quality and riparian management and track attendance.
5. Publicize all watershed improvement projects in the news media, newsletters, websites, etc.
6. Conduct at least 1 HOA interesting in hosting an educational program.

10-15 Years

1. Maintain watershed website.
2. Conduct at least 1 seminar related to benefits of native plants and natural area restoration and track attendance.
3. Conduct at least 1 seminar related to agricultural BMPs and track attendance.
4. Conduct at least 2 seminars related to water quality and riparian management and track attendance.

5. Publicize all watershed improvement projects in the news media, newsletters, websites, etc.
6. Conduct at least 1 HOA interesting in hosting an educational program.

Monitoring Needs/Efforts:

- Track all watershed projects being implemented each year.
- Track number and topic of workshops each year.
- Track changes in attendance at workshops and seminars.
- Track number of workshops hosted by HOAs.

Remedial Actions:

- Ask local, state, and federal agencies to host workshops.
- If attendance at workshops is low, experiment with different types of events to see which draw larger participation.
- Identify a volunteer or hire staff to lead the educational efforts.

Notes:

Grade Evaluation:
A = Met or exceeded milestone(s)
B = Milestone(s) 75% achieved
C = Milestone(s) 50% achieved
D = Milestone(s) 25% achieved
F = Milestone(s) not achieved

Appendix A

UNION DITCH/VIRGIL DITCH WATERSHED STEERING COMMITTEE
MEETING MINUTES

January 9, 2013

The Union Ditch/Virgil Ditch Watershed Steering Committee (WSC) met on January 9, 2013 at 3:30 p.m. in the DeKalb County Administrative Building, Conference Room East, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Nathan Schwartz, Donna Prain, Dean Johnson, Karen Miller, Jeremy Lin, and Brian Gregory. Also in attendance were Rebecca Von Drasek and Deanna Doohaluk,.

1. **Roll Call** -- *Mr. Miller noted that Committee member Roger Steimel was absent.*

2. **Approval of Agenda --** *Mr. Gregory moved to approve the agenda, seconded by Mr. Miller, and the motion carried unanimously.*

3. Committee Organization and Structure

Ms. Zurbrugg nominated Dean Johnson for the chair of the Committee and the nomination was approved unanimously.

Ms. Zurbrugg nominated Paul Miller as Vice-Chairman and the nomination was approved unanimously.

Mr. Miller moved that the Committee use Roberts Rules of Order and that a quorum of the whole be sufficient for approval of motions before the Committee. Following a brief discussion, the motion was approved unanimously.

4. Watershed Plan Overview

Mr. Johnson recognized Mr. Miller.

Mr. Miller provided the WSC with a brief history of the 319 grant application. He observed that the intent of the watershed study was to identify major features of the watershed and present potential solutions to water quantity and quality issues. Mr. Miller emphasized that he expected the process to review regulations, policies, and propose projects. He noted that the WSC was tasked with overseeing the 319 grant and the resulting watershed plan.

Karen Miller confirmed that the in-kind work being done by the Committee would be tracked. Ms. Doohaluk explained that the matching funds require reporting the work in-kind by Committee and staff members. She offered to provide staff with a spreadsheet for tracking those costs.

Ms. Doohaluk from Hey and Associates made a short Powerpoint presentation which informed the Committee of the watershed-based planning process. She explained that her firm and Baxter and Woodman would be the technical consultants and that they would gather information and create the actual plan.

The Committee briefly discussed the 319 grant and the process which would include identifying stakeholders, holding workshops, providing education, collecting data, and creating the plan.

Ms. Doohaluk explained that the timeline is roughly 18 months to complete the project and that the deadline is June of 2014. She highlighted the items to be completed, including workshops, education components, website, and the action plan for future projects.

The Committee also discussed the creation of a "refined" outline of the entire process at their next meeting.

5. Goals & Objectives

Ms. Miller was asked about Kane County's experience with the Watershed planning process. She reported that there are similar watershed projects in Kane County (i.e. Blackberry Creek, Tyler Creek, and Ferson-Otter Creek). She noted that the stakeholders' commitment to the watershed project is vital for success. Ms. Miller stated that the Fox River Watershed Group had completed extensive research on the local watersheds. Ms. Doohaluk agreed and noted that there was a copious amount of data related to the Fox River watershed.

Ms. Doohaluk said that the data would dictate the watershed modeling and project selection would be based on that modeling. In addition, she noted that conservation design and suggested changes to ordinances would be born from the watershed information gathered by the consultants.

Ms. Doohaluk informed the Committee that the goal and objectives would be created through the initial workshops.

6. Technical Advisory Committee Membership

The Committee discussed whom to appoint to the Technical Advisory Committee (TAC) and named, Joel Maurer, Jon Laskowski, Norm Beeh, Bill Lorence, Nathan Schwartz, Dean Johnson, and Jeremy Lin as prospective members.

Ms. Doohaluk explained that the TAC would be asked to review the modeling and load data to concur with the engineers on the measurement determinations.

Mr. Miller added that the TAC could also be adjusted if necessary in the future.

Ms .Zurbrugg moved to accept the names as the appointed TAC, seconded by Mr. Miller, the motion was approved unanimously.

7. Working Group Membership

The Committee briefly reviewed the list to date of property owners and those with potentially affected interests in the vicinity of the watershed would be kept appraised of the progress.

Staff requested Ms. Miller review the list and help identify important property owners on the Kane County side.

Mr. Miller noted that the"Working Group" members would be invited to attend upcoming workshops and would be provided with updates regarding the creation of the plan.

8. Next Steps

The Committee asked Ms. Doohaluk what her next steps would be. She planned to contact the County's GIS Department for all available information, and also mentioned beginning to collect whatever other information about major features (i.e. culverts, tiles, etc.) within the watershed. Mr. Miller offered to assist with the initial contact with the Information Management Office. Mr. Miller also offered to contact a local pipeline to find out if they have any information regarding field tiles.

In addition, the Committee decided that it would be important to hold the introductory workshops as soon as possible so as not to conflict with the planting season. After a brief discussion the first workshop was tentatively scheduled to be held March 5, 2013 at the Farm Bureau and directed toward agricultural producers and their needs, and the second workshop on March 7, 2013 at the Community Foundation Building and focused on the urban impacts on the watershed. The Committee agreed that Ms. Doohaluk would lead the workshops.

Ms. Prain arrived 4:05 pm

9. Next Meeting

After a brief discussion the Committee decided to meet monthly at 3:30 pm on the second Wednesday of the month.

The Committee will next meet on February 13, 2013 at 3:30 pm in the Conference Room East.

10. ***Adjournment*** *-- Mr. Miller motioned to adjourn, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER
WATERSHED STEERING COMMITTEE
MEETING MINUTES
February 13, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on February 13, 2013 at 3:30 p.m. in the DeKalb County Administrative Building, Conference Room East, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Donna Prain, Dean Johnson, Karen Miller, Diana Kamysz (for Committee member Jeremy Lin), Roger Steimel, and Brian Gregory. Also in attendance were Rebecca Von Drasek, Deanna Doohaluk, and Greg Millburg.

1. **Roll Call** -- *Mr. Miller noted that Diana Kamysz would be sitting in for Jeremy Lin. Donna Prain and Nathan Schwartz were absent*

2. **Approval of Agenda --** *Mr. Miller moved to amend the agenda to include approval of the minutes and moved for approval of the amended agenda, seconded by Ms. Zurbrugg , and the motion carried unanimously.*

3. **Approval of Minutes --** *Mr. Gregory moved to approve the minutes from January 9, 2013, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

4. Refined Process Outline

Ms. Doohaluk reported to the Committee that she intended to complete the Watershed Resources Inventory report for the IEPA by the end of April, 2013. She requested from the Committee data items that she still needed to create the Inventory. The Committee Members informed her of whom she could contact regarding each of the outstanding items.

Mr. Miller asked for a more detailed timeline for the Committee to reference and identify tasks necessary to complete prior to certain deadlines. Ms. Zurbrugg offered to review the deadlines and craft a more detailed timeline for the Committee.

The Committee briefly discussed the creation of a web page. Mr. Miller agreed to speak to the DeKalb County Information Management Office and request a link and a page for posting relevant information.

5. Specific Goals and Objectives

Ms. Doohaluk emphasized the need for the Committee to formulate goals for the watershed plan.

The Committee determined that in order to create draft goals prior to the March workshops all the Committee Members would submit five concerns for the watershed to Deanna Doohaluk to compile. Ms. Doohaluk explained that the concerns could be either specific site examples or larger concerns for the entire watershed.

Donna Prain arrived at 4 p.m.

6. Official Plan Name

After a brief deliberation the Committee members settled on the name Union / Virgil Ditches & East Branch of the Kishwaukee River Watershed Plan.

Mr. Miller moved to make the official plan name "Union / Virgil Ditches & East Branch of the Kishwaukee River Watershed Plan", seconded by Ms. Prain, and the motion carried unanimously.

7. March 2013 Workshops

The Committee discussed creating, mailing, and posting the flyers for the March workshops.

Ms. Doohaluk explained that she would forward the March flyers to the EPA for review and approval.

Staff offered to distribute the flyers via e-mail and mail after Ms. Zurbrugg made a few updates.

Mr. Johnson volunteered to create four maps for the public to mark-up at the workshops.

The Committee also briefly discussed the proposed format for the workshops.

8. Next Meeting

The Committee will next meet on March 13, 2013 at 3:30 pm in the Conference Room East.

9. ***Adjournment -- Mr. Miller motioned to adjourn, seconded by Ms. Zurbrugg, and the motion carried unanimously.***

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER
WATERSHED STEERING COMMITTEE
MEETING MINUTES
March 13, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on March 13, 2013 at 3:30 p.m. in the DeKalb County Administrative Building, Conference Room East, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Donna Prain, Dean Johnson, Karen Miller, Jeremy Lin, Roger Steimel, and Adam Orton (for Committee member Brian Gregory). Also in attendance were Rebecca Von Drasek, Deanna Doohaluk, and Dan Gibble.

1. **Roll Call** -- *Jeremy Lin, Donna Prain, and Nathan Schwartz were absent*

2. **Approval of Agenda --** *Mr. Miller moved to approve the agenda, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

3. **Approval of Minutes --** *Ms. Zurbrugg moved to approve the minutes from February 13, 2013, seconded by Ms. Karen Miller, and the motion carried unanimously.*

Jeremy Lin arrived 3:40 pm

4. Sycamore Park District Input

Mr. Johnson introduced Mr. Gibble from the Sycamore Park District. The Park District representatives were unable to attend the March 7, 2013 workshop and asked to have a time to meet with the Steering Committee to discuss the watershed plan.

Mr. Gibble provided the Committee members with a packet of materials and made a brief presentation detailing the current and future development of Park District properties. He highlighted the willingness of the District to partner with local entities to complete projects. He also pointed out what resources the Park District could offer. He concluded with the observation that the District could not complete the projects alone and looked forward to finding projects that would address watershed issues.

Ms. Zurbrugg asked if the Park District was aware of the Live Healthy Initiative, specifically its emphasis on hiking/biking trail projects. Mr. Gibble said he was not aware of the Initiative. Mr. Miller added that the Park District is a member of DeKalb Sycamore Area Transportation Study (DSATS) so the Initiative is aware of the MPO’s proposed and existing trail network.

Mr. Gibble explained that the District had recently created pond maintenance regulations. He explained that the District was working to convert five of the eight ponds under its jurisdiction to include more native species. He explained that naturalizing the ponds reduces maintenance costs, deters geese, and contributes to better water quality. Finally, he pointed out that the District owned a property between Airport Road and the East Branch that might be a good location for a future wetland project. He highlighted photographs from the packet of a similar project which he had completed in Urbana, IL. He stated that the constructed wetland project may also include foot trails and soccer fields.

Ms. Doohaluk agreed to include the site as a possible wetland within the modeling component of the watershed plan. She noted that this would be a great target project for consideration for including in the final watershed plan.

Mr. Miller asked if the project might reduce flooding in the golf course. Mr. Gibble stated that the District was hopeful for that result.

Donna Prain arrived at 4 p.m.

Mr. Miller encouraged Mr. Gibble to attend the Steering Committee meetings in the future.

5. March 7th Workshop Review

The Steering Committee had originally scheduled two workshops. Due to bad weather the March 5th workshop was cancelled. The Committee hosted a workshop on March 7th at the DeKalb County Community Foundation building.

Mr. Johnson opined that the workshop had accomplished the goal of gathering stakeholder input. He asked the Committee members for their thoughts about the workshop.

Ms. Prain observed that people in attendance where generally positive and provided quality input.

Ms. Zurbrugg stated that initially she was concerned that attendance was too low but after observing the workshop she stated that the attendance was the right number for the venue.

Ms. Miller thanked Ms. Zurbrugg for offering the venue.

Mr. Miller expressed interest in seeing all of the comments tallied, and in comparing findings of future workshops.

Ms. Miller stated she hoped that more municipalities could be encouraged to attend future workshops.

Mr. Miller asked the Committee if another workshop was needed. Following a brief discussion the Committee decided that more information would be better than too little and they concluded a second workshop should be held. The Committee chose April 10, 2013 at the 7 pm at the DeKalb County Farm Bureau building.

6. Goal Prioritization -- Ms. Doohaluk said she is generating Goals and Objectives based on the tally of Committee Members and workshop attendees comments.

7. Project Timeline

The Committee noted staff's timeline spreadsheet and asked that it be distributed and posted on the web page.

Ms. Doohaluk also explained that she had not received a response regarding her request to the IEPA for an extension for the Water Resources Inventory Report. The Committee discussed the timeline briefly and Mr. Miller agreed to re-forward Ms. Doohaluk's request to the IEPA.

8. Miscellaneous: web page, logo, information distribution

The Committee discussed future informational meetings. Ms. Zurbrugg suggested the creation of a sub-committee to plan and organize these events. Follow a brief discussion, Mr. Johnson, Ms. Prain, and Ms. Zurbrugg volunteered for the sub-committee.

Ms. Zurbrugg noted that her office was working on a logo for the watershed plan.

Staff informed the Committee that the web page had the general information posted on a page on the County web site.

The Committee also briefly discussed information distribution to the "Working Group" members. The Committee directed staff to send out a monthly reminder (a week prior to the Committee meeting) which would include the upcoming agenda and direct the "Working Group" members to the Watershed web page for review of the minutes. Ms. Prain also suggested adding an "unsubscribe" option to the e-mails.

9. Next Meeting

The Committee rescheduled their April 10, 2013 meeting to 6:00 pm prior to the planned workshop both meetings will be held at the DeKalb County Farm Bureau.

10. Adjournment -- *Mr. Miller motioned to adjourn, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER
WATERSHED STEERING COMMITTEE
MEETING MINUTES
April 10, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on April 10, 2013 at 6:00 p.m. in the DeKalb County Farm Bureau, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Donna Prain, Dean Johnson, Karen Miller, Roger Steimel, Nathan Schwartz, and Adam Orton (for Committee member Brian Gregory). Also in attendance were Rebecca Von Drasek, Deanna Doohaluk, and Jodie Wollnik.

1. Roll Call -- *Jeremy Lin was noted absent.*

2. Approval of Agenda -- Ms. Zurbrugg requested that the agenda be amended to include a discussion on logo ideas and student involvement.

Mr. Miller moved to approve the amended agenda, seconded by Mr. Steimel, and the motion carried unanimously.

3. Approval of Minutes -- *Ms. Zurbrugg moved to approve the minutes from March 13, 2013, seconded by Mr. Miller, and the motion carried unanimously.*

4. Watershed Plan Status

Ms. Doohaluk reported that the IEPA was on-board with the revised timeline she had proposed for the Watershed Resources Inventory. She informed the Committee that the information collection for the Inventory was almost complete. She also reported that the comments from the workshop were being combined for inclusion with the Inventory.

Mr. Miller asked Ms. Doohaluk when the first bill would be received for Hey & Associates services. Ms. Doohaluk responded that the first bill would be sent after the Inventory report has been finalized and submitted to the IEPA.

5. Logo Discussion

Ms. Zurbrugg provided the Committee with six sample logos. The Committee responded with feedback for Ms. Zurbrugg to make revisions and present the Committee with a final logo for approval.

6. Outreach Subcommittee Report

Ms. Zurburgg reported that the Subcommittee had met and discussed the Outreach Programs the group would like to offer in the Fall. Ms. Zurburgg provided the Committee with a handout detailing the Subcommittee's findings. She encouraged Committee members to review the handout and provide her with any comments. She noted that bus tours were proposed to try and encourage participants to realize the size and scope of the Watershed issue. Ms. Zurburgg also invited any other members wishing to participate on the Subcommittee to let her know.

7. April 10 Workshop Preparation

Mr. Johnson explained that the Workshop following the meeting would be the same format as the March 7th Workshop.

8. Next Meeting

The Committee will next meet on May 8, 2013 at 3:00 pm in the Conference Room East. **Please note the change of the meeting start time to 3:00 pm.**

9. Adjournment -- *Mr. Miller motioned to adjourn, seconded by Mr. Schwartz, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE
MEETING MINUTES
May 8, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on May 8, 2013 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Dean Johnson, Jodie Wollnik (for Committee Member Karen Miller), Roger Steimel, Jeremy Lin, and Brian Gregory. Also in attendance were Rebecca Von Drasek and Deanna Doohaluk.

1. Roll Call -- *Nathan Schwartz and Donna Prain were noted absent.*

2. Approval of Agenda -- Mr. Miller requested that the logo discussion be switched with the Water Resources Inventory on the agenda as staff attempted to contact Deanne Doohaluk for the conference call.

Mr. Miller moved to approve the amended agenda, seconded by Mr. Lin, and the motion carried unanimously.

3. Approval of Minutes -- *Ms. Zurbrugg moved to approve the minutes from April 10, 2013, seconded by Mr. Steimel, and the motion carried unanimously.*

4. Logo Discussion

Ms. Zurbrugg provided the Committee with sample final logo. The Committee responded with feedback for Ms. Zurbrugg to make final revisions. She agreed to make the changes and present the Committee with the final logo for approval.

Ms. Zurbrugg indicated that she would forward an electronic version to staff for inclusion on the web page and for distribution to the Committee.

Ms. Wollnik arrived at 3:10 pm.

5. April 10 Workshop Preparation

The Committee noted the Kane County drainage districts participation at the workshop. The Committee also observed that the discussion had included the regulation of dredging ditches.

Ms. Wollnik elaborated on the Kane County drainage districts difficulties due to the long time frame of inactivity.

Mr. Miller highlighted the summary sheets from Deanne Doohaluk.

Mr. Steimel confirmed that certain comments at the workshop were associated with an individual person.

The Committee spoke briefly about the Evergreen mitigation project.

The Committee contacted Deanna Doohaluk by phone at 3:20 pm.

The Committee agreed to send any additional information that should have been included within workshop notes to Deanna.

6. Watershed Plan Status

Mr. Johnson confirmed that Ms. Doohaluk was continuing to create the specific goals for the watershed plan.

Staff asked if the goals would be part of the Watershed Resources Inventory. Ms. Doohaluk explained that the goals would be very specific and the process would continue to be refined and would be include with the Watershed Plan.

Ms. Doohaluk suggested that the Watershed Resources Inventory was close to being in a draft form for presentation to the Committee and IEPA.

Mr. Lin confirmed that the modeling will start after a presentation to the Committee at the July meeting to determine the best option for modeling.

7. Next Meeting

The Outreach Committee will meet in June to finalize the planning for the late summer outreach workshops. Ms. Zurbrugg invited other Steering Committee members to be part of the Outreach subcommittee.

Ms. Wollnik reported contacting a few farmers and others in the watershed for the bus tour. She agreed to drive the watershed and look for addition points of interest. She noted that the Village of Virgil was upgrading their septic systems which might also be an opportunity.

Mr. Gregory offered to host the tour group at the Sycamore treatment plant.

The Steering Committee will next meet on July 10, 2013 at 3:00 pm in the Conference Room East.

Please note the meeting start time of 3:00 pm.

8. Adjournment -- *Mr. Miller motioned to adjourn, seconded by Mr. Gregory, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE
MEETING MINUTES
July 10, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on July 10, 2013 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Dean Johnson, Karen Miller, Roger Steimel, Diana Kamysz (for Committee Member Jeremy Lin), Donna Prain, Nathan Schwartz, and Brian Gregory. Also in attendance were Mike Konen, Rebecca Von Drasek and Deanna Doohaluk.

1. Roll Call -- *All members present.*

2. Approval of Agenda – *Mr. Schwartz moved to approve the amended agenda, seconded by Mr. Gregory, and the motion carried unanimously.*

3. Approval of Minutes -- *Ms. Zurbrugg moved to approve the minutes from May 8, 2013, seconded by Mr. Steimel, and the motion carried unanimously.*

4. Watershed Plan Status:

Ms. Doohaluk updated the Committee as to the progress of the Watershed Inventory report. She highlighted deficiencies in information related to detention basins.

Ms. Prain outlined for the Committee a data-collection endeavor she organized to include within the Inventory report. The data collection would consist of a detention basin survey and a stream survey. Ms. Prain explained that students from Sycamore High School and NIU would be performing the field work. She briefly explained the procedural steps the students would follow and provided the Committee with a memo detailing the survey locations.

Ms. Miller agreed to ask Kane County municipalities about basin inventories.

Mr. Miller asked when the Inventory would be completed. Ms. Doohaluk responded that there was no hard deadline but she had a personal goal to have a draft by the end of July.

Mr. Johnson suggested that the identified survey locations become future data collection sites.

Ms. Doohaluk suggested that the mapping and basic outline should be completed by the beginning of August.

Mr. Johnson agreed to provide Ms. Doohaluk with a detailed list of agricultural projects within the watershed by program.

Ms. Doohaluk explained that once the Watershed Inventory was complete then the next step would be modeling the watershed. She noted that the Technical Advisory Committee (TAC) to the

Steering Committee would need to meet to review the proposed modeling structure.

5. Outreach Committee Report

Ms. Zurbrugg provided the Committee with a handout detailing the June 26, 2013 meeting of the Outreach subcommittee. The subcommittee decided on three community meetings, the first of which would be held either September 12th or September 19th for the Agricultural community, and the others which would be tours in the spring. Ms. Zurbrugg highlighted the proposed tour schedule for the Committee.

The Committee briefly discussed the proposed tour routes.

Ms. Zurbrugg noted that the original budget did not include the costs of the tours, she agreed to undertake the responsibility of applying for grants to cover the estimated $5,000 costs.

The Committee also discussed the prospective “boating” tour and suggested that creating a list of snags within the watershed’s waterways might be useful information.

6. Next Meeting

The Steering Committee will next meet on August 14, 2013 at 3:00 pm in the Conference Room East.

8. Adjournment -- *Ms. Prain motioned to adjourn, seconded by Mr. Schwartz, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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Note: These minutes are not official until approved by the Union / Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee at a subsequent meeting. Please refer to the meeting minutes when these minutes are approved to obtain any changes to these minutes.

DeKalb County Government
Sycamore, Illinois

UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE MINUTES

September 11, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on September 11, 2013 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Dean Johnson, Roger Steimel, Diana Kamysz (for Committee Member Jeremy Lin), Donna Prain, Nathan Schwartz, and Adam Norton (for Committee Member Brian Gregory). Also in attendance were Mike Konen, Norm Beeh, Jim Sparber (Baxter Woodman), Deanna Doohaluk and Jeff Wickenkamp (Hey & Associates), and Rebecca Von Drasek.

1. Roll Call -- *Karen Miller was absent.*

2. Approval of Agenda – *Mr. Schwartz moved to approve the agenda, seconded by Mr. Miller, and the motion carried unanimously.*

3. Approval of Minutes -- *Mr. Miller moved to approve the minutes from July 10, 2013, seconded by Mr. Schwartz, and the motion carried unanimously.*

4.-7. Water Resources Inventory Status (Additional Data Collection, Modeling Options, and Identified Problem Areas)

Ms. Doohaluk updated the Committee as to the progress of the Water Resources Inventory report. She explained that a draft version of the report was provided to IEPA, and that IEPA staff requested a detailed stream inventory. However, she noted that the 319 grant application had not included funding for this research and that IEPA had agreed that the additional work is not required for this watershed project. Ms. Doohaluk informed the Committee she would ask IEPA to put in writing that the stream inventory was not necessary for the successful completion of the Watershed Plan.

Ms. Doohaluk did a short PowerPoint presentation for the Committee. The presentation updated the accomplishments of the Plan project to date, and highlighted two suggested modeling approaches PLOAD and HEC-HMS. Ms. Doohaluk explained that PLOAD would provide a good model of pollutants and HEC-HMS would provide information about the quantity of water. She noted that 45 sub-basins had been identified and the modeling would show how the sub-basins within the watershed function.

The Committee and TAC members briefly discussed the models and confirmed that they would support these two options.

Ms. Doohaluk agreed to provide draft goals and objectives for the Watershed Plan to the Committee at the October meeting. She also provided a spreadsheet of the known problem areas which were taken from the information gathered at the Spring workshops. Mr. Miller noted that this list was previously provided to the members. The Committee agreed to review the spreadsheet and provide comments at the October meeting.

8. Watershed Tour -- Ms. Zurbrugg highlighted the upcoming bus tour and encouraged attendance. She provided the Committee with a copy of the tour survey which will be given to participants following the tour.

9. Next Meeting -- The Steering Committee will next meet on October 9, 2013 at 3:00 pm in the Conference Room East.

10. Adjournment -- *Mr. Miller motioned to adjourn, seconded by Mr. Schwartz, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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Note: These minutes are not official until approved by the Union/Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee at a subsequent meeting. Please refer to the meeting minutes when these minutes are approved to obtain any changes to these minutes.

Note: These minutes are not official until approved by the Union / Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee at a subsequent meeting. Please refer to the meeting minutes when these minutes are approved to obtain any changes to these minutes.

UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE MINUTES

October 9, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on October 9, 2013 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Dean Johnson, Karen Miller, and Brian Gregory. Also in attendance were Jim Sparber (Baxter Woodman), Deanna Doohaluk and Jeff Wickenkamp (Hey & Associates), and Rebecca Von Drasek.

1. **Roll Call** -- *Nathan Schwartz, Donna Prain, Roger Steimel, and Jeremy Lin were noted absent.*

2. **Approval of Agenda –** *Ms. Zurbrugg moved to approve the agenda, seconded by Mr. Gregory, and the motion carried unanimously.*

3. **Approval of Minutes --** *Ms. Zurbrugg moved to approve the minutes from September 11, 2013, seconded by Mr. Miller, and the motion carried unanimously.*

4. **Report of Watershed Tour**

Ms. Zurbrugg reported that approximately 35 people attended the watershed tour. She provided the Committee with a summary the tour surveys, filled out by the participants. Ms. Zurbrugg noted that the majority of respondents indicated that they learned something from the tour. She informed the Committee that the costs would be covered as part of the in-kind match for the 319 Grant. Ms. Zurbrugg asked the Committee if the tour should be offered again in the Spring.

Mr. Johnson thanked Ms. Zurbrugg for her efforts. He encouraged the continuation of the tours noting the positive response to this type of outreach.

Ms. Doohaluk agreed with the participants' preference to preform an activity at each stop in the tour.

Ms. Zurbrugg noted that future tours might need to be longer and she also felt that the group needed to emphasize the history and objective of the Union/Virgil Ditches & East Branch of the Kishwaukee River Watershed.

The Committee thanked Ms. Zurbrugg, the Community Foundation, and the subcommittee for planning and providing the tour.

5. Review of Final Goals and Objectives

Ms. Doohaluk explained that the draft Goals and Objectives were created for review of the committee.

Ms. Zurbrugg asked if "green" infrastructure was included within the language of the goal and objectives section. The Committee briefly discussed the various meanings of "green" infrastructure.

Ms. Doohaluk noted that she correlates Best Management Practices (BMPs) with sustainable or "green" practices.

Mr. Wickenkamp noted that CMAP, Chicago Wilderness, and other planning documents might define the term "green" in a variety of ways. Ms. Miller noted that the Kane County plans also reference "green" infrastructure as both green practices (i.e. rain barrels, gardens, etc), as well as, greenways or open space.

Ms. Zurbrugg suggested that the discussion on how to define "green" infrastructure might be a pertinent discussion for the Winter outreach meeting for elected officials. Ms. Zurbrugg asked for Committee Members input and direction.

Mr. Miller asked that the Goals be rewritten as statements of fact. In that way, after efforts are taken to achieve the goals, they can be answered with a "yes" or a "no." Ms. Zurbrugg agreed with Mr. Miller. Ms. Doohaluk agreed to reformat the goal as statements.

The Committee then discussed the outcomes and the realities of completing the projects suggested by the Watershed Plan. Mr. Gregory referenced a proposed dredging project and emphasized the difficulties in completing the project due to State agency oversight. Ms. Doohaluk agreed to acknowledge the importance of the cooperation of the stakeholders and agencies who oversee the projects within the Plan.

Ms. Doohaluk noted that the suggested responses to implement the goals of the watershed plan would include programmatic and project specific suggestions.

6. Report on Modeling

Ms. Doohaluk noted that final tweaks were being done to the models and she informed the Committee that they expected to run the models after finalizing the land use information. The consultants expect to have some results for the Committee by November, 2013.

Ms. Doohaluk noted that Ms. Prain has additional information to provide from the student data collection, as well as, finalizing information about detention basins.

7. Review of Identified Problem Areas

The Committee reviewed the spreadsheet created by Ms. Doohaluk from the comments received at the workshops. Ms. Doohaluk and Mr. Wickenkamp explained where applicable site specific solutions would be identified to address problems.

Mr. Miller also noted the benefit of identifying site specific problems to continue to encourage compliance.

Mr. Johnson observed that some of the items are not concerns rather than items of interest or best management practices which the workshops attendees were also encouraged to share. These items should be dropped off of the list of problem areas.

Mr. Wickenkamp also noted that when NPDES permits are involved with a specific use the suggestion within the spreadsheet might be to review the permits to confirm an understanding of the standards that an operator is required to meet.

The Committee discussed bridges within the watershed and discussed if those structures were the cause of flooding or simply located within areas prone to flooding. Mr. Wickenkamp agreed to review the specific sites and indicate if a bridge was undersized and would create a blanket statement regarding the need to review of bridges within the watershed.

After a brief discussion the Committee requested that the column heading “Submitted Concern” be re-titled “Submitted Observation.” Mr. Johnson noted that be renaming the column Best Management Practices can also be highlighted.

The Committee reviewed the remaining items of the spreadsheet and supported the proposed solutions.

8. Next Meeting -- The Steering Committee will next meet on November 13, 2013 at 3:00 pm in the Conference Room East.

Ms. Doohaluk provided the Committee with a draft Table of Contents and internal Committee concerns to be discussed at the November meeting.

Ms. Zurbrugg also suggested for a future meeting a need for a discussion with how the group will distribute the plan.

9. Adjournment -- *Mr. Gregory motioned to adjourn, seconded by Mr. Miller, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

RGV:rgv
P:\Grading\CountywideOrd\Watershed\Minutes\October 2013.wpd

Note: These minutes are not official until approved by the Union/Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee at a subsequent meeting. Please refer to the meeting minutes when these minutes are approved to obtain any changes to these minutes.

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE MINUTES

November 13, 2013

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on November 13, 2013 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Dean Johnson, Karen Miller, and Nathan Schwartz. Also in attendance were Deanna Doohaluk (Hey & Associates) and Rebecca Von Drasek.

1. **Roll Call –** *Brian Gregory, Donna Prain, Roger Steimel, and Jeremy Lin were noted absent.*

2. **Approval of Agenda –** *Mr. Schwartz moved to approve the agenda, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

3. **Approval of Minutes --** *Mr. Miller moved to approve the minutes from October 9, 2013, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

4. Discussion on Watershed Report Format

The Committee reviewed the draft Table of Contents for the Watershed Plan. Ms. Doohaluk went through the handout and highlighted the various components to be included within the Plan.

Mr. Miller asked for a reference within the Introduction that the Union/Virgil Ditches and East Branch of the Kishwaukee River Watershed Plan would serve as a model for future watershed plans.

Ms. Miller requested that a section of the plan reference the importance of Illinois Drainage Law. After a brief discussion the Committee observed that the speakers John Wills and/or John Church, with the Fox River Program, may be good resources to tap into for future outreach workshops.

5. Best Management Practice Fact Sheets

Ms. Doohaluk provided the Committee with a draft Best Management Practice Fact Sheets, which will be included within Chapter Four of the Watershed Plan.

The Committee suggested including a list of suggested native vegetation species within the Fact Sheets.

6. Status of Modeling

Ms. Doohaluk gave a PowerPoint presentation regarding the data from the HEC-HMS model of the watershed. She acknowledged some basic assumptions that were made regarding the hydrology within the model, (ie. Bulletin 70 and Muskingum-Cunge equation). She explained that the results from the modeling will provide a valuable framework for future site specific modeling of the watershed which could include cross-sections. Ms. Doohaluk also noted that the results from the modeling will also allow the consultants to pinpoint locations within the watershed to suggest projects and find solutions to reduce flooding and improve water quality.

Ms. Doohaluk offered to present the results from the PLOAD model at the December meeting.

Ms. Zurbrugg asked Mr. Schwartz if this information would be helpful. Mr. Schwartz responded that for future road projects the County would be required to complete a full study. Ms. Doohaluk hoped having a larger area of the watershed already modeled would make the future studies more precise.

7. Review of Solutions and Best Management Practices

The Committee had a brief discussion regarding possible solutions and best management practices. Ms. Doohaluk noted that the consultants will review the models and make suggestions to reduce erosion, improve water quality and habitat protection

Ms. Zurbrugg suggested that the Plan include a cost benefit analysis to show how the Best Management Practices will save money.

The Committee discussed the possible failures of existing features and suggested design improvements that might retrofit the features to improve the flow and water quality within the watershed.

Ms. Doohaluk observed that the EPA has targeted the Kishwaukee River for projects and informed the Committee that grant applications are due in August. She suggested a partnership with the Sycamore Park District might result in a desirable project for the watershed.

Ms. Doohaluk also promised to review the Stormwater Ordinance requirements within the County and municipalities and suggest revisions to regulations that would promote better stormwater and water quality practices.

8. Next Meeting -- The Steering Committee will next meet on December 11, 2013 at 3:00 pm in the Conference Room East.

Ms. Zurbrugg also suggested for a future meeting a need for a discussion with how the group will rollout the plan, begin to conceptualize the outreach meetings, and possible future 319 applications.

9. Adjournment -- *Mr. Schwartz motioned to adjourn, seconded by Ms. Miller, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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Note: These minutes are not official until approved by the Union / Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee at a subsequent meeting. Please refer to the meeting minutes when these minutes are approved to obtain any changes to these minutes.

UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE MINUTES

January 8, 2014

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on January 8, 2014 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Dean Johnson, Karen Miller, Brian Gregory, and Roger Steimel. Also in attendance were Deanna Doohaluk (Hey & Associates) and Rebecca Von Drasek.

1. **Roll Call** –*Nathan Schwartz, Donna Prain, and Jeremy Lin were noted absent.*

2. **Approval of Agenda –** *Ms. Zurbrugg moved to approve the agenda, seconded by Mr. Gregory, and the motion carried unanimously.*

3. **Approval of Minutes --** *Ms. Zurbrugg moved to approve the minutes from November 13, 2013, seconded by Ms. Miller, and the motion carried unanimously.*

4. Status of Modeling

Ms. Doohaluk reported that she was finalizing the PLOAD data setup and that she had encountered a problem the required technical expertise from a member of her firm. She explained that she would report on the data after the problem was resolved. Ms. Doohaluk noted that the HEC-HMS data had been given to Kane County. She also asked about the Detention Basin Survey and site erosion assessments completed by the Sycamore High School students and Ms. Prain. Ms. Zurbrugg volunteered to contact the High School representatives regarding the information.

5. Outreach Status

Ms. Zurbrugg provided the Committee with a handout which detailed the findings from the Outreach subcommittee's last meeting. She reported that the DeKalb County Community Foundation had also awarded the County $4,000 to be used for the wetland refinement project, and had "parked" with the County an additional $37,000 that could be applied in the future to projects associated with the watershed plan or future watershed planning.

The Committee briefly discussed invoicing the State and the importance of the In-Kind Logs. Staff was directed to work with Ms. Doohaluk to complete the Invoice Reimbursement Documentation.

Ms. Zurbrugg lead the Committee in a discussion about a outreach meetings with elected and appointed officials in late March 2014, a bus tour for officials in April or May, a meeting with Agricultural producers in March, and workshops reporting back to the Community about the draft Plan. The Committee agreed to each of these meetings. Ms. Zurbrugg and Ms. Miller agreed that a presentation regarding the Plan should be scheduled for May 15, 2014 at 9 a.m. for the Energy and Environment Committee of the Kane County Board. The Committee agreed to finalize these dates at its February meeting.

6. Project Schedule Review

Ms. Doohaluk made a short PowerPoint presentation detailing the final five months of the Watershed Steering Committee project.

7. Next Meeting -- The Steering Committee will next meet on February 5, 2014 at 3:00 pm in the Conference Room East.

8. Adjournment -- *Mr. Miller motioned to adjourn, seconded by Mr. Steimel, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE MINUTES

February 5, 2014

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on February 5, 2014 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Anita Zurbrugg, Dean Johnson, Nathan Schwartz, and Adam Orton (for Committee member Brian Gregory). Also in attendance were Deanna Doohaluk (Hey & Associates via conference call), Jack Bennett, and Rebecca Von Drasek.

1. **Roll Call –** *Karen Miller, Roger Steimel, Donna Prain, and Jeremy Lin were noted absent.*

2. **Approval of Agenda –** *Ms. Zurbrugg moved to approve the agenda, seconded by Mr. Schwartz, and the motion carried unanimously.*

3. **Approval of Minutes --** *Mr. Schwartz moved to approve the minutes from January 8, 2014, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

4. Status of Modeling

Ms. Doohaluk reported that she was finalizing the PLOAD data review. The Committee briefly discussed the results with Ms. Doohaluk.

Mr. Schwartz asked if the results were characteristic of the agricultural nature of the watershed. Ms. Doohaluk noted that the levels were not surprising nor unexpected.

Mr. Miller asked if the results would lend themselves to recommendations in water quality improvements. Ms. Doohaluk noted that the results would indicate a need for general best management practices, but not a particular, specific project or program.

Ms. Doohaluk anticipated including the modeling data within the inventory portion of the Watershed Plan.

5. Report on Stream/Detention Basin Data

The presenters were absent. Ms. Zurbrugg offered to contact them to determine if they could attend the March meeting.

6. Outreach Status

Ms. Zurbrugg questioned if the Committee future steps would include additional applications to IEPA for implementation or planning grants. The Committee suggested that the future projects for which the grants would be sought could include an education booklet, the Sycamore Park District wetland project, continuing the Sycamore School District stream studies and other possible projects. The Committee committed to creating a project list at the March meeting.

Ms. Doohaluk agreed to contact the State Agencies to determine what types of grants they are looking to fund.

Following a brief discussion, the Committee decided to invite the Park District and the DeKalb County Community Foundation Land Use Committee members to attend the March Meeting to discuss future projects and grant applications.

The Outreach Subcommittee had met and scheduled a March 20 meeting at the DeKalb County Farm Bureau to discuss Best Management Practices training, farm programs available under the new Farm Bill, and a brief overview of the Watershed Plan.

Ms. Zurbrugg explained the Subcommittee’s Bus Tour of the Watershed will be repeated in April or early May on a Saturday morning, and would include a tour of Sycamore’s wastewater treatment plant. The Committee thought May 17th or May 24th would be possible dates.

Ms. Zurbrugg also highlighted that the Elected and Appointed presentation prospective dates were evening meetings on April 24 or April 22, 2014. Ms. Zurbrugg agreed to contact the IEPA state representative to confirm she can present on either of those dates and to determine a meeting location.

Jack Bennett, DeKalb County Farmland Foundation, thanked the Committee for recognizing his attendance and he requested future updates on the Committee’s progress.

7. Next Meeting -- The Steering Committee will next meet on March 12, 2014 at 3:00 pm in the Conference Room East.

8. Adjournment -- *Mr. Schwartz motioned to adjourn, seconded by Mr. Orton, and the motion carried unanimously.*

Respectfully submitted,

____
Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE MINUTES

April 9, 2014

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on April 9, 2014 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Paul Miller, Dean Johnson, Nathan Schwartz, Roger Steimel Karen Miller, Anita Zurbrugg, and Brian Gregory. Also in attendance were Deanna Doohaluk (Hey & Associates) and Rebecca Von Drasek.

1. Roll Call – *Donna Prain and Jeremy Lin were noted absent.*

2. Approval of Agenda – Ms. Zurbrugg requested that the Agenda be amended to include a discussion of the review process of the Watershed Plan

Ms. Miller moved to approve the amended agenda, seconded by Ms. Zurbrugg, and the motion carried unanimously.

3. Approval of Minutes -- *Mr. Gregory moved to approve the minutes from March 12, 2014, seconded by Ms. Zurbrugg, and the motion carried unanimously.*

4. Programmatic Action Items Rating

Ms. Doohaluk reported that she had received review comments for Chapter Five from Kane County and DeKalb County representatives. She indicated that by early May, 2014 a draft needs to be provided the IEPA. She also suggested that one additional outreach meeting to report the results was necessary for the general public. Ms. Doohaluk informed the Committee that she would request an extension to June 30, 2014 for the final draft of the Watershed Plan. She stated that this type of extension would be typical and likely to be approved.

Ms. Zurbrugg suggested that requesting the extension is acceptable provided it is approved and that the project is still on target to meet all the State's grant requirements.

Ms. Zurbrugg moved to direct the consultant, Hey & Associates, to seek IEPA approval of an extension to June 30, 2014, seconded by Mr. Miller, and the motion carried unanimously.

Ms. Doohaluk agreed to seek the extension.

Ms. Zurbrugg suggested that the bus tour could be planned in June. She stated that the presentation of the final plan should be done separately of the bus tour and the Committee agreed.

Ms. Doohaluk asked the Committee to continue to review the chapters of the draft plan and provide feedback. She showed the Committee maps of the prioritized "sub-watersheds", and noted that the transition from agricultural use to urban use was the main reason for choosing these "sub-watersheds". Ms. Doohaluk emphasized that the plan would include watershed wide ideas and site specific suggestions. She stressed the importance of these "sub-watershed" areas and noted that by highlighting them the plan would encourage positive practices and note opportunities for improving water quality in the future.

The Committee opined that redevelopment was preferable to new development.

Mr. Miller noted that the land use plans for many of the communities may change significantly from previously approved land use plans due to economic factors.

The Committee debated the site specific consideration for parking lots. Mr. Gregory did not want to make an example of any specific property owner. Ms. Doohaluk observed that the plan as impact if specific examples are given. Mr. Miller offered that the County's parking lots as an example, noting that they are within the watershed and will be improved once the jail expansion begins.

Ms. Miller reported that she was approached by Gerard Fabrizius regarding a project on his farm for improving the watershed.

5. Outreach Program Update

The Committee discussed the April 24th Outreach meeting for decision makers. Ms. Zurbrugg encouraged members to reach out to elected and appointed officials to attend.

The Committee mentioned the project web page hosted on the DeKalb County web site and discussed necessary improvements to better present the final plan to the public.

Ms. Zurbrugg noted that the bus tour will be scheduled late May or early June.

6. Review Process of the Watershed Plan

Ms. Doohaluk asked for Chapter 3 review comments by April 25, 2014. She asked that in early June the public be presented the final draft in June.

7. Next Meeting -- The Steering Committee will next meet on May 14, 2014 at 3:00 pm in the Conference Room East.

8. Adjournment -- *Mr. Gregory motioned to adjourn, seconded by Mr. Steimel, and the motion carried unanimously.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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Note: These minutes are not official until approved by the Union/Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee at a subsequent meeting. Please refer to the meeting minutes when these minutes are approved to obtain any changes to these minutes.

UNION /VIRGIL DITCHES & EAST BRANCH OF THE KISHWAUKEE RIVER WATERSHED STEERING COMMITTEE MINUTES

May 16, 2014

The Union /Virgil Ditches & East Branch of the Kishwaukee River Watershed Steering Committee (WSC) met on May 16, 2014 at 3:00 p.m. in the DeKalb County Administration Building, in Sycamore, Illinois. In attendance were Committee members Dean Johnson, Karen Miller, and Anita Zurbrugg. Also in attendance were Deanna Doohaluk (Hey & Associates) and and County staff Rebecca Von Drasek, Marcellus Anderson, and Lisa Sanderson.

1. **Roll Call –** *Donna Prain, Paul Miller, Nathan Schwartz, Roger Steimel, Brian Gregory and Jeremy Lin were noted absent.*

Mr. Johnson noted the lack of quorum and indicated that the meeting would commence to discuss the agenda topics however no actions would be taken by the Committee.

2. **Approval of Agenda –** No present members objected to the written agenda.

3. **Approval of Minutes –** No corrections were offered to the draft minutes. The approval of the minutes will be included with the June meeting agenda.

4. Conference Call with Kane County representatives

Ms. Wollnik thanked the Committee for allowing her to participate via conference call. She indicated that she and Ms. Doohaluk had been in contact separately to discuss the issues surrounding Virgil Township drainage ditches. She explained that many of these waterways were man-made and felt that this should be noted within the final Watershed Plan differentiating the history of the watershed, and that this history be taken into consideration when determining which BMPs are suggested be used in these areas.

Ms. Doohaluk explained to the Committee how she intended to incorporate the comments within the Watershed Plan.

5. Draft Watershed Plan and Chapter Reviews

Ms. Doohaluk distributed copies of a draft of Section 5.4 of the Watershed Plan, The Site Specific Action Plan, identifying the problem areas in the watershed and the recommended BMPs for addressing these problem areas. Ms. Doohaluk noted that the section will a table summarizing the projects, a draft copy of which was distributed, and that a map identifying the location of each of these areas was still being prepared. Ms. Doohaluk went through the section and discussed the various items. She also asked that the Committee inform her of any other areas that should be added to the list.

6. Outreach Program Update

Ms. Doohaluk asked for Chapter 3 review comments by April 25, 2014. She asked that in early June the public be presented the final draft in June.

It was noted that the May 15, 2014 presentation to the Kane County Board Committee was rescheduled to June 12, 2014.

7. Web Page Design

The Committee discussed with Ms. Sanderson the Watershed Plan web page. Ms. Sanderson explained that the web page was currently under the Planning and Zoning Department page. The Committee explained that they would provide additional information to Ms. Sanderson to try and further fill out the web page. Ms. Doohaluk had multiple photos that she would forward to Ms. Sanderson to add to the site. Ms. Sanderson noted that the County's Facebook and Twitter presence.

8. Next Meeting -- The Steering Committee will next meet on June 11, 2014 at 2:00 pm in the Conference Room East, with an open house prior to the meeting to present the final Plan.

9. Adjournment -- *Mr. Johnson adjourned the meeting.*

Respectfully submitted,

Dean Johnson
Chairman, DeKalb County Union Ditch/Virgil Ditch Watershed Steering Committee

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Appendix B

STREAM NAME:_____Kishwaukee River___REACH ID:__________ DATE:___8/6/13_ Page 1 of 14

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS # 42.00355 N, 88.71652 W

REACH BOUNDARY-UPSTREAM: GPS # 42.00335 N, 88.71585 W

APPROX. LENGTH (ft):__200___ TEMP. (◦F): ___76____ TIME: ____10:00 AM________

RECENT RAIN: (Now, 12, 24, 48 hours, week)___24 hours_ How much:____0.23”_______

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity:____598____mS/cm or **µS/cm** (circle one)

Temperature: ___N/A___°F

pH:___7.5_____

Nitrate:	79.6 %	110 mg/L
Nitrite:	%	mg/L
Phosphate:	53.0 %	1.62 mg/L
Sulfide:	93.3 %	< 0.1 mg/L
Sulfate:	16.8 %	82 mg/L
Turbidity	86.5 %	21 NTU
Ammonia	51.6%	1.75 mg/L

WATER COLOR: CLEAR_____ BROWN__[X]___ GREEN_____ GRAY______

Water Clarity: <6in __[X]___ 6-12in _____ 12-18in ______ >18in ______

Aesthetics:

Foam/scum _____ Oil sheen _____ Trash/litter _____ Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor ______

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes____[X]______ No____________

STREAM NAME:______Kishwaukee River___REACH ID:__________ DATE:___8/6/13_ Page 2 of 14

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes ___[X]____ No ________

Mayflies: __[X]_ Caddisflies: __[X]_ Dragonflies:_____ Damselflies:__[X]_

Snails: __[X]_ Amphipods: __[X]_ Isopods: _____ Leeches: __[X]_

Worms: __[X]_ Water Pennies: _____ Beetles: _____ Crayfish:__[X]__

Other: Fingernail Clams, Simuliidae, Haliplidae, Frogs

Fish: Observed Yes ___[X]____ No ________

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: Minnows

Birds: Observed Yes _______ No ________ (N/A)

Ducks: _____ Geese: _____ Herons: _____ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______

Others:____

REPTILES:____

AMPHIBIANS:____

MAMMALS:____

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

No	Yes (how many)	GPS#
0-10ft	1	
10-20ft	2	
20-30ft	2	
30-40ft	1	
40-50ft	0	
50-60ft	0	
60-70ft	0	
70-80ft	1	
80-90ft	1	
90-100ft	0	
100-110ft	0	
110-120ft	1	
120-130ft	1	
130-140ft	0	
140-150ft	0	
150-160ft	0	
160-170ft	2	
170-180ft	1	
180-190ft	2	
190-200ft	4	

STREAM NAME:______Kishwaukee River___REACH ID:___________ DATE:___8/6/13_ Page 4 of 14

Channel Flow (Stream Stage):

NONE	LOW	MODERATE	***NORMAL ****	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	Moderate	***Low***	None
Development	Excellent	Good	***Fair***	Poor
Channelization	***None***	Recovered	Recovering	Recent or No Recovery
Stability	***High***	Moderate	Low	

STREAM NAME:______Kishwaukee River___REACH ID:__________ DATE:___8/6/13_ Page 5 of 14

Pool /Riffle Development: Pool __0___ % Riffle __30__ % Run __70__% Glide __0__ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth

6"	Best Areas > 10cm
	Best Areas 5 - 10 cm
	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
6.2"	Maximum < 50 cm

Riffle / Run Substrate

	Stable (Cobble, boulder)
	Mod. Stable (Large gravel)
[X] 100%	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

	None
[X]	Low
	Moderate
	Extensive

Degree of Bank Erosion:

NONE	***LOW****	MODERATE	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW __[X]___ MODERATE _____ HIGH ____
OVERBANK: LOW __[X]___ MODERATE _____ HIGH _____

Impounded: YES:_______ NO:____[X]_____

Mid-Stream Bars and Islands: Yes:___[X]____ No:______

Types and Locations of High Cases: __Between 100-150 ft downstream___________

NONE	***LOW***	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

STREAM NAME:______Kishwaukee River___REACH ID:___________ DATE:___8/6/13_ Page 7 of 14

Degree of Armoring: NONE **LOW** MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	X
Boulder	
Cobble	
Gravel	
Sand	
Bedrock	

Other Types

Hardpan	
Detritus	X
Muck	X
Silt	X
Artificial	X

Origin

Limestone		Rip/Rap	
Tills	X	Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	
Moderate	
Normal	X low
Free	

Embeddedness

Extensive	
Moderate	
Normal	X low
None	

STREAM NAME:______Kishwaukee River___REACH ID:____________ DATE:___8/6/13_ Page 8 of 14

Channel Conditions measured at 50ft intervals

BANK HEIGHT (FT)	HEIGHT (FT) L/R	GPS #
0	3'5" / 4'	42.00355 N, 88.71652 W
50	3'6" / 4'6"	N/A
100	3'8" / 3'9"	N/A
150	3'6" / 3'6"	N/A
200	4'6" / 4'9"	42.00335 N, 88.71585 W
BANK SLOPE (RUN/RISE) ft	SLOPE	GPS #
0	13 / 44	
50	18 / 45	
100	30 / 44	
150	24 / 40	
200	36.5 / 45	
WATER DEPTH (ft)	DEPTH (FT)	GPS #
0	2" / 9"	
50	3" / 6"	
100	2" / 2"	
150	3" / 4"	
200	3" / 3"	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	71.8	
50	76.8	
100	94.2	
150	78.3	
200	97.5	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	62.6	
50	67.7	
100	79.5	
150	68.4	
200	59.7	

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (ft/s)	GPS#
0	6	
50	1.3	
100 *(115)	8.25	
150	7.5	
200	1.1	

Instream Cover:

Check all that apply

Undercut Banks		Pools > 70 cm		Aquatic Macrophytes	X
Overhanging Vegetation	X	Rootwads		Oxbows, Backwaters	
Shallows (in slow water)	X	Boulders		Logs or woody Debris	X
Rootmats		Oxbows, Backwaters			

Amount

Extensive > 75%	
Moderate 25 - 75%	
Sparse 5 - < 25%	X
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent: < 5% Rooted Submergent:__20% Rooted Floating:____

Free Floating:____ Floating Algae:____ Attached Algae: < 5% No Vegetation: 75-80%

Floodplain Vegetation and Landuse(within 100 ftof stream)

Dominant Land Use (%):

Left: Agricultural:______ Open Space:___100___ Recreational: ______
Commercial/Industrial:______ Residential:______ Other:______

Right: Agricultural:___50___ Open Space:___50___ Recreational:______
Commercial/Industrial:_____ Residential:______ Other:______

Land Cover (%):
Left: Trees: _90%___ Lawn:______ Wetlands:______ Crops:______ Shrubs:______
Herbaceous: __10%__ Impervious:______ Water:______ Other: ______

Right: Trees: __50%_ Lawn:______ Wetlands:______ Crops:______ Shrubs:______
Herbaceous: __50%__ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	**Moderate**	**Narrow**	**Very Narrow**	**None**
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:	X	X		
Left Bank: X	X	X		

Bank Vegetation (within 10 ft of stream): ***Predominant Vegetation:***

Left Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:_X__ Shrub:___ Crop:___
Herbaceous: _X__ None:___ Other:_____

Right Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:_X__ Shrub:___ Crop:___
Herbaceous: _X__ None:___ Other:_____

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows____ Box Elder__X__ Honeysuckle___ Buckthorn___ Hardwoods___ Other_X__

STREAM NAME:______Kishwaukee River___REACH ID:___________ DATE:___8/6/13_ Page 12 of 14

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)
					None

STREAM NAME:______Kishwaukee River___REACH ID:___________ DATE:___8/6/13_ Page 13 of 14

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
					None

*55/120

OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 44 Fair

Stream & Location: Kishwaukee River *RM:* _ _ _ . _ *Date:* _ _ / _ _ / 06

________ *Scorers Full Name & Affiliation:* ________

River Code: _ _ - _ _ _ - _ _ _ *STORET #:* ______ *Lat./ Long.:* (NAD 83 - decimal °) _ _ . _ _ _ _ _ /8 _ . _ _ _ _ _ Office verified location ☐

1] *SUBSTRATE* Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☐ ☐ BOULDER [9]	___	___	☐ ☐ DETRITUS [3]	___	___
☐ ☐ COBBLE [8]	___	___	☐ ☐ MUCK [2]	___	___
☐ ☐ GRAVEL [7]	___	___	☐ ☐ SILT [2]	___	___
☐ ☐ SAND [6]	___	___	☐ ☐ ARTIFICIAL [0]	___	___
☐ ☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 6 Maximum 20

2] *INSTREAM COVER* Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
____ POOLS > 70cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
____ LOGS OR WOODY DEBRIS [1]

AMOUNT

Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover 7 Maximum 20

3] *CHANNEL MORPHOLOGY* Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel 14 Maximum 20

4] *BANK EROSION AND RIPARIAN ZONE* Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION	RIPARIAN WIDTH	FLOOD PLAIN QUALITY	
L R	L R	L R	L R
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	Indicate predominant land use(s) past 100m riparian.
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Comments

Riparian 10 Maximum 10

5] *POOL / GLIDE AND RIFFLE / RUN QUALITY*

MAXIMUM DEPTH

Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH

Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH > RIFFLE WIDTH [0]

CURRENT VELOCITY

Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☐ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 1 Maximum 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run 4 Maximum 8

6] *GRADIENT* (ft/mi)

DRAINAGE AREA (mi²)

- ☐ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: ( ) %GLIDE: ( )
%RUN: ( ) %RIFFLE: ( )

Gradient 2 Maximum 10

EPA 4520

06/16/06

Additional criteria

Aquatic Biota:

Macroinvertebrates **[2]**

- -Excellent (4)
- - Good (2)
- - Fair (1)
- - Poor/None (0)

Fish/Amphibians **[2]**

- - Present (2)
- - None (0)

Big Clams **[2]**

- -Excellent (4)
- -Good (2)
- -Fair (1)
- -Poor/None (0)

Water Quality

Aqueous Chemistry **[3]**

- -Excellent (7)
- -Good (5)
- -Fair (1)
- -Poor (0)

Aesthetics **[2]**

- -Excellent (3)
- -Good (2)
- -Fair (1)
- -Poor (0)

STREAM NAME:______Heron Creek_____ REACH ID:__________ DATE:_8-9-13__ Page 1 of 13

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS #____42.01022 N, 88.71428 W_____

REACH BOUNDARY-UPSTREAM: GPS #_____42.01014 N, 88.71376 W______

APPROX. LENGTH (ft):___200_____ TEMP. (·F): ___76_____ TIME: ______9:00 am________

RECENT RAIN: (Now, 12, 24, 48 hours, week)______None_______ How much:_____0______

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity: ____686____ mS/cm or *µS/cm* (circle one)

Temperature: ____19.6____ ^{oC}

pH:_____7.07 (high turbidity w/in the 200ft) and 7.8 (low turbidity outside of the 200ft)

Nitrate: ___83______ % _____.41_____mg/L
Nitrite: ____82.4_____ % _____.22_____mg/L
Phosphate: ____81.2_____ %______.54____mg/L
Sulfide: ____86.1____ % _______.2____mg/L
Sulfate: ____99.8____ % _____<1_____mg/L
Ammonia ___44____% _____2.37_____mg/L
Turbidity___87.5_____% _____19_____NTU

WATER COLOR: CLEAR__X___ BROWN_____ GREEN_____ GRAY______
Water Clarity: <6in _____ 6-12in _X(CTB)____ 12-18in ______ >18in ______

Aesthetics:
Foam/scum _____ Oil sheen _____ Trash/litter __X___ Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor ______

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes_____X_____ No____________

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes ___X____ No ________

Mayflies: __X___ Caddisflies: _____ Dragonflies:__X__ Damselflies:______

Snails: ___X__ Amphipods: _____ Isopods: _____ Leeches: _____

Worms:__X___ Water Pennies: _____ Beetles: __X___ Crayfish:____

Other:__(See notes)___

Fish: Observed Yes _______ No ________ (N/A)

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: _____

Birds: Observed Yes _______ No ________ (N/A)

Ducks: _____ Geese: _____ Herons: _____ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______

Others:____

REPTILES:____

AMPHIBIANS:__________Green Frog________________________________

MAMMALS:____

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

	No	Yes (how many)	GPS#
0- 10ft	X		
10- 20ft	X		
20- 30ft	X		
30-40ft	X		
40-50ft	X		
50-60ft	X		
60-70ft	X		
70- 80ft	X		
80- 90ft	X		
90-100ft	X		
100- 110ft	X		
110- 120ft	X		
120- 130ft	X		
130- 140ft	X		
140- 150ft	X		
150- 160ft	X		
160- 170ft	X		
170- 180ft	X		
180- 190ft	X		
190- 200ft	X		

Comment: Only found 10 dead shells

STREAM NAME:______Heron Creek_____ REACH ID:____________ DATE:_8-9-13__ Page 4 of 13

Channel Conditions measured at 50ft intervals

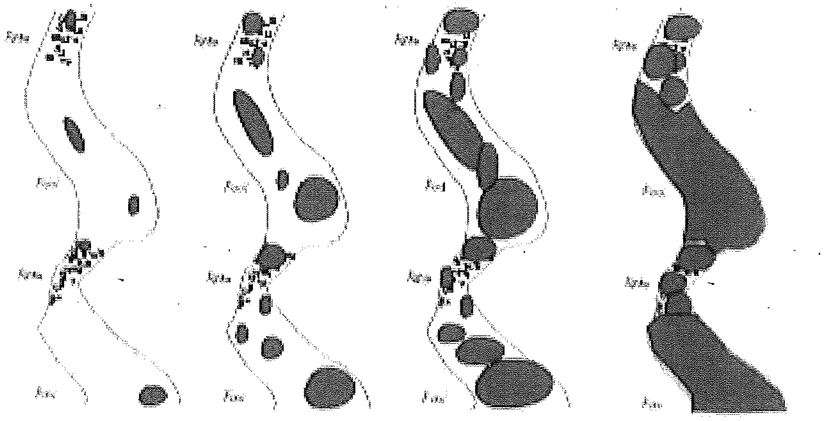
BANK HEIGHT	HEIGHT (FT) L/R	GPS #
0ft	2’5” / 2’10”	42.01022 N, 88.71428 W
50ft	2’0” / 2’6”	42.01019 N, 88.71426 W
100ft	2’4” / 2’8”	42.01008 N, 88.71405 W
150ft	2’0” / 2’10”	42.01008 N, 88.71397 W
200ft	2’3” / 2’6”	42.01014 N, 88.71376 W
BANK SLOPE (RUN/RISE)	SLOPE L/R	GPS #
0	19 / 40	
50	13 / 19	
100	22 / 30	
150	38 / 18	
200	36 / 19	
WATER DEPTH	DEPTH (FT) L/R	GPS #
0	1” / 2”	
50	2” / 2”	
100	1” / 2”	
150	1” / 1”	
200	2” / 3”	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	21.1	
50	20	
100	19.4	
150	18.4	
200	22.1	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	12.9	
50	14.4	
100	13.0	
150	12.7	
200	15.5	

Channel Flow (Stream Stage):

NONE	*LOW*	*MODERATE*	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	*Moderate*	Low	None
Development	Excellent	Good	Fair	*Poor*
Channelization	*None*	Recovered	Recovering	Recent or No Recovery
Stability	*High*	*Moderate*	Low	

Embeddedness



[illegible]

[illegible]

[illegible]

[illegible]

Pool /Riffle Development: Pool _____ % Riffle ______ % Run ___100_% Glide ______ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth (N/A)

	Best Areas > 10cm
	Best Areas 5 - 10 cm
	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
X	Maximum < 50 cm

Riffle / Run Substrate

	Stable (Cobble, boulder)
	Mod. Stable (Large gravel)
X	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

	None
	Low
	Moderate
X	Extensive

Degree of Bank Erosion:

NONE	LOW	**MODERATE**	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW _____ MODERATE __X___ HIGH ____
OVERBANK: LOW _____ MODERATE ___X__ HIGH _____

Impounded: YES:_______ NO:____X_____

Mid-Stream Bars and Islands: Yes:_______ No:__X____

Types and Locations of High Cases: ____________**None**____________________________

NONE	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

STREAM NAME:______Heron Creek_____ REACH ID:___________ DATE:_8-9-13__

Degree of Armoring: *NONE* LOW MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	
Boulder	
Cobble	
Gravel	
Sand	
Bedrock	

Other Types

Hardpan	
Detritus	
Muck	X
Silt	X
Artificial	X

Origin

Limestone		Rip/Rap	
Tills		Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	X
Moderate	
Normal	
Free	

Embeddedness

Extensive	X
Moderate	
Normal	
None	

STREAM NAME:______Heron Creek_____ REACH ID:____________ DATE:_8-9-13__ Page 9 of 13

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (sec/ft)	GPS#
0	0	
50	0	
100	0	
150	0	
200	0	

STREAM NAME:______Heron Creek_____ REACH ID:____________ DATE:_8-9-13__

Instream Cover:

Check all that apply

Undercut Banks	X	Pools > 70 cm		Aquatic Macrophytes	
Overhanging Vegetation	X	Rootwads		Oxbows, Backwaters	
Shallows (in slow water)		Boulders		Logs or woody Debris	X
Rootmats					

Amount

Extensive > 75%	
Moderate 25 - 75%	X
Sparse 5 - < 25%	
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent:____ Rooted Submergent:_____ Rooted Floating:____

Free Floating:_<5_ Floating Algae:____ Attached Algae:__<5 No Vegetation:__95__

Floodplain Vegetation and Landuse(within 100 ftof stream)

Dominant Land Use (%):

Left: Agricultural:______ Open Space:__100____ Recreational: ______
Commercial/Industrial:______ Residential:______ Other:______

Right: Agricultural:______ Open Space:______ Recreational:______
Commercial/Industrial:_____ Residential:___100___ Other:______

Land Cover (%):
Left: Trees: __90____ Lawn:______ Wetlands:______ Crops:______ Shrubs:______
Herbaceous: ___10___ Impervious:______ Water:______ Other: ______

Right: Trees: ______ Lawn:___98___ Wetlands:______ Crops:______ Shrubs:______
Herbaceous: ___2___ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	**Moderate**	**Narrow**	**Very Narrow**	**None**
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:				X
Left Bank:	X			

Bank Vegetation (within 10 ft of stream): ***Predominant Vegetation:***

Left Bank: Unmowed Grass:_X__ Lawn:___ Wetland:___ Trees:_X__ Shrub:_X__ Crop:___
Herbaceous: _X__ None:___ Other:_____

Right Bank: Unmowed Grass:___ Lawn:_X__ Wetland:___ Trees:___ Shrub:___ Crop:___
Herbaceous: ___ None:___ Other:_____

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows____ Box Elder_____ Honeysuckle_X__ Buckthorn___ Hardwoods_X__ Other___

STREAM NAME:______Heron Creek_____ REACH ID:___________ DATE:_8-9-13__ Page 12 of 13

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)
					None

STREAM NAME:______Heron Creek_____ REACH ID:___________ DATE:_8-9-13__ Page 13 of 13

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
					None

*30/120

OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet *QHEI Score:* 30 Poor

Stream & Location: Heron Creek *RM:* ___ . _ *Date:* __/__/ 06

______________________ *Scorers Full Name & Affiliation:* ______________________

River Code: __ - ___ - ___ *STORET #:* ______ *Lat./ Long.:* (NAD 83 - decimal °) __ . ______ /8_ . ______ Office verified location ☐

1] *SUBSTRATE*
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	____	____	☐ ☐ HARDPAN [4]	____	____
☐ ☐ BOULDER [9]	____	____	☐ ☐ DETRITUS [3]	____	____
☐ ☐ COBBLE [8]	____	____	☐ ☐ MUCK [2]	____	____
☐ ☐ GRAVEL [7]	____	____	☐ ☐ SILT [2]	____	____
☐ ☐ SAND [6]	____	____	☐ ☐ ARTIFICIAL [0]	____	____
☐ ☐ BEDROCK [5]	____	____	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2]
☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate Maximum 20: 0

2] *INSTREAM COVER*
Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
____ POOLS > 70cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
____ LOGS OR WOODY DEBRIS [1]

AMOUNT
Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 10

3] *CHANNEL MORPHOLOGY*
Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12

4] *BANK EROSION AND RIPARIAN ZONE*
Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	(L R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	Indicate predominant land use(s) past 100m riparian.
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Comments

Riparian Maximum 10: 7

5] *POOL / GLIDE AND RIFFLE / RUN QUALITY*

MAXIMUM DEPTH
Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH > RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☐ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
circle one and comment on back

Comments

Pool / Current Maximum 12: -1

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average)

☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 0

6] *GRADIENT* (ft/mi)

DRAINAGE AREA (mi²)

- ☐ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: ( ) %GLIDE: ( )
%RUN: ( ) %RIFFLE: ( )

Gradient Maximum 10: 2

EPA 4520 06/16/06

Additional criteria

Aquatic Biota:

Macroinvertebrates **[0]**

-Excellent (4)
- Good (2)
- Fair (1)
- Poor/None (0)

Fish/Amphibians **[2]**
- Present (2)
- None (0)

Big Clams **[0]**
-Excellent (4)
-Good (2)
-Fair (1)
-Poor/None (0)

Water Quality

Aqueous Chemistry **[5]**

-Excellent (7)
-Good (5)
-Fair (1)
-Poor (0)

Aesthetics **[2]**

-Excellent (3)
-Good (2)
-Fair (1)
-Poor (0)

STREAM NAME: ___Union Ditch ___ REACH ID:_____#1______ DATE:_8/14/13__ Page 1 of 13

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS #___41.92039 N 88.64757 W______

REACH BOUNDARY-UPSTREAM: GPS #__41.92009 N 88.64810 W_______

APPROX. LENGTH (ft):____200____ TEMP. (°F): __71_____ TIME: ______9:00 AM________

RECENT RAIN: (Now, 12, 24, 48 hours, week)_______NONE_______ How much:_____0______

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity:___785_____mS/cm or **µS/cm** (circle one)

Temperature: ____57.3____ °F

pH:___8.6_____

Nitrate:	80.4 %	49 mg/L
Nitrite:	85.7 %	.16 mg/L
Phosphate:	66.3 %	1.07 mg/L
Sulfide:	89.1 %	0.1 mg/L
Sulfate:	67.5 %	26 mg/L
Ammonia	39 %	2.9 mg/L
Turbidity	91.2 %	13 NTU

WATER COLOR: CLEAR__X___ BROWN_____ GREEN_____ GRAY______

Water Clarity: <6in __X___ 6-12in _____ 12-18in ______ >18in ______

Aesthetics:

Foam/scum _____ Oil sheen _____ Trash/litter _____ Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor ______

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes_____X_____ No____________

STREAM NAME: ___Union Ditch ___ REACH ID:_____#1_______ DATE:_8/14/13__ Page 2 of 13

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes ___X____ No ________

Mayflies: _____ Caddisflies: __X___ Dragonflies:_____ Damselflies:__X___

Snails: __X__ Amphipods: __X__ Isopods: __X__ Leeches: __X__

Worms:__X___ Water Pennies: _____ Beetles: __X___ Crayfish:__X__

Other: hemiptera belostomatidae, pipuladae, back swimmer, water boatman, midge, chironomus (see notes)

Fish: Observed Yes _______ No ____X____

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:_____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: _____

Birds: Observed Yes _______ No ___X_____

Ducks: _____ Geese: _____ Herons: _____ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______

Others:____

REPTILES:____

AMPHIBIANS:____

MAMMALS:____

STREAM NAME: ___Union Ditch___ REACH ID:_____#1_______ DATE:_8/14/13__ Page 3 of 13

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

	No	Yes (how many)	GPS#
0- 10ft	X		
10- 20ft	X		
20- 30ft	X		
30-40ft	X		
40-50ft	X		
50-60ft	X		
60-70ft	X		
70- 80ft	X		
80- 90ft	X		
90-100ft	X		
100- 110ft	X		
110- 120ft	X		
120- 130ft	X		
130- 140ft	X		
140- 150ft	X		
150- 160ft	X		
160- 170ft	X		
170- 180ft	X		
180- 190ft	X		
190- 200ft	X		

STREAM NAME: ___Union Ditch___ REACH ID:_____#1_______ DATE:_8/14/13__ Page 4 of 13

Channel Conditions measured at 50ft intervals

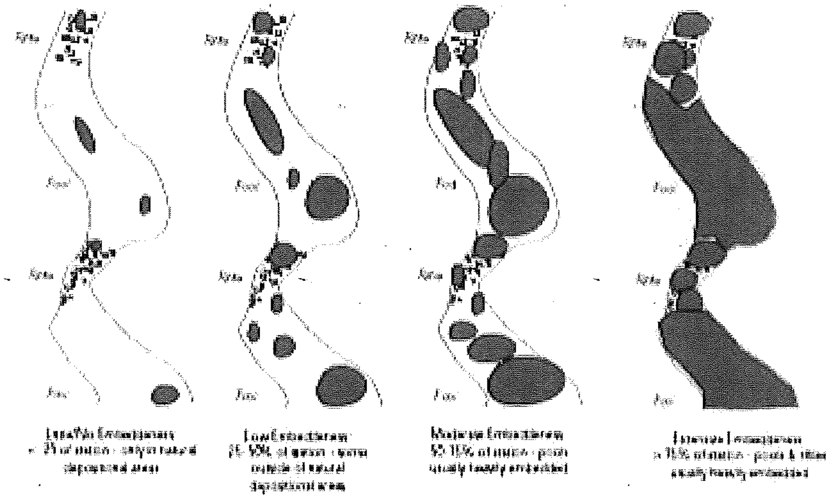
BANK HEIGHT (ft)	HEIGHT (FT) L/R	GPS #
0	3'11" / 3'6"	41.92039 N, 88.64757 W
50	1'10" / 3'0"	41.92043 N, 88.64755 W
100	2'6" / 3'5"	41.92032 N, 88.64771 W
150	3'0" / 3'0"	41.92025 N, 88.64794 W
200	2'8" / 3'2"	41.92009 N, 88.64810 W
BANK SLOPE (RUN/RISE) ft	SLOPE L/R	GPS #
0	85 / 22	
50	86 / 21	
100	85 / 52	
150	80 / 56	
200	87 / 30	
WATER DEPTH (ft)	DEPTH (FT) L/R	GPS #
0	2" / 6"	
50	1" / 2"	
100	6" / 2"	
150	2" / 1"	
200	2" / 3"	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	26'4"	
50	20'5"	
100	22'0"	
150	21'6"	
200	23'7"	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	18'2"	
50	14'6"	
100	13'5"	
150	14'7"	
200	16'1"	

Channel Flow (Stream Stage):

NONE	LOW	MODERATE	NORMAL [X]	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	Moderate	***Low***	None
Development	Excellent	Good	Fair	***Poor***
Channelization	***None***	Recovered	Recovering	Recent or No Recovery
Stability	***High***	Moderate	Low	

Embeddedness



Pool /Riffle Development: Pool __0__ % Riffle ___0__ % Run __100__% Glide ___0__ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth

	Best Areas > 10cm
	Best Areas 5 - 10 cm
X	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
X	Maximum < 50 cm

Riffle / Run Substrate

	Stable (Cobble, boulder)
X	Mod. Stable (Large gravel)
X	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

X	None
	Low
	Moderate
	Extensive

Degree of Bank Erosion:

NONE [X]	LOW	MODERATE	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW __X___ MODERATE _____ HIGH ____
OVERBANK: LOW __X___ MODERATE _____ HIGH _____

Impounded: YES:_______ NO:____X_____

Mid-Stream Bars and Islands: Yes:_______ No:__X____

Types and Locations of High Cases: ____________N/A______________________________

NONE [X]	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

Degree of Armoring: NONE ***LOW*** MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	
Boulder	
Cobble	
Gravel	X
Sand	X
Bedrock	

Other Types

Hardpan	
Detritus	
Muck	
Silt	X
Artificial	

Origin

Limestone		Rip/Rap	
Tills		Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	
Moderate	
Normal	X
Free	

Embeddedness

Extensive	
Moderate	
Normal	X
None	

STREAM NAME: ___Union Ditch ___ REACH ID:_____#1_______ DATE:_8/14/13__

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (sec/ 10ft)	GPS#
0	0.0	
50	0.35	
100	0.16	
150	0.51	
200	0.0	

Instream Cover:

Check all that apply

Undercut Banks		Pools > 70 cm		Aquatic Macrophytes	
Overhanging Vegetation	X	Rootwads		Oxbows, Backwaters	
Shallows (in slow water)		Boulders		Logs or woody Debris	
Rootmats					

Amount

Extensive > 75%	
Moderate 25 - 75%	X
Sparse 5 - < 25%	
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent:__10__ Rooted Submergent:____ Rooted Floating:__10__

Free Floating:____ Floating Algae:__25__ Attached Algae:____ No Vegetation:___55___

Floodplain Vegetation and Landuse (within 100 ft of stream)

Dominant Land Use (%):

Left: Agricultural:______ Open Space:__25____ Recreational: ______
Commercial/Industrial:______ Residential:___75___ Other:______

Right: Agricultural:___100___ Open Space:______ Recreational:______
Commercial/Industrial:_____ Residential:______ Other:______

Land Cover (%):

Left: Trees: ___5___ Lawn:___95___ Wetlands:______ Crops:______ Shrubs:______
Herbaceous: ______ Impervious:______ Water:______ Other: ______

Right: Trees: ______ Lawn:______ Wetlands:______ Crops:___90___ Shrubs:______
Herbaceous: ___10___ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	**Moderate**	**Narrow**	**Very Narrow**	**None**
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:			X	
Left Bank:		X		

Bank Vegetation (within 10 ft of stream): *Predominant Vegetation:*

Left Bank: Unmowed Grass:___ Lawn:_X__ Wetland:___ Trees:_X__ Shrub:___ Crop:___
Herbaceous: ___ None:___ Other:__(see notes)___

Right Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:___ Shrub:___ Crop:_X__
Herbaceous: ___ None:___ Other:__(see notes)___

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows_ Box Elder_ Honeysuckle_ Buckthorn__ Hardwoods__ Other: **Cottonwood, Mulberry**

STREAM NAME: __Union Ditch ___ REACH ID:_____#1_______ DATE:_8/14/13__ Page 12 of 13

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)
					None

STREAM NAME: ___Union Ditch___ REACH ID:_____#1_______ DATE:_8/14/13__ Page 13 of 13

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
					Trap East of Bridge
					Flood 8' beyond mow line

*54/120

OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 48 Fair

Stream & Location: Union Ditch #1 *RM:* ____ *Date:* __/__/ 06

Scorers Full Name & Affiliation: ______

River Code: __-__-__ *STORET #:* ______ *Lat./ Long.:* (NAD 83 - decimal °) __.____ /8__.____ Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES POOL RIFFLE
- ☐ ☐ BLDR /SLABS [10] ____ ____
- ☐ ☐ BOULDER [9] ____ ____
- ☐ ☐ COBBLE [8] ____ ____
- ☐ ☐ GRAVEL [7] ____ ____
- ☐ ☐ SAND [6] ____ ____
- ☐ ☐ BEDROCK [5] ____ ____

OTHER TYPES POOL RIFFLE
- ☐ ☐ HARDPAN [4] ____ ____
- ☐ ☐ DETRITUS [3] ____ ____
- ☐ ☐ MUCK [2] ____ ____
- ☐ ☐ SILT [2] ____ ____
- ☐ ☐ ARTIFICIAL [0] ____ ____

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 15 Maximum 20

2] INSTREAM COVER
Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

- ____ UNDERCUT BANKS [1]
- ____ OVERHANGING VEGETATION [1]
- ____ SHALLOWS (IN SLOW WATER) [1]
- ____ ROOTMATS [1]
- ____ POOLS > 70cm [2]
- ____ ROOTWADS [1]
- ____ BOULDERS [1]
- ____ OXBOWS, BACKWATERS [1]
- ____ AQUATIC MACROPHYTES [1]
- ____ LOGS OR WOODY DEBRIS [1]

AMOUNT
Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover 8 Maximum 20

3] CHANNEL MORPHOLOGY
Check ONE in each category (Or 2 & average)

SINUOSITY
- ☐ HIGH [4]
- ☐ MODERATE [3]
- ☐ LOW [2]
- ☐ NONE [1]

DEVELOPMENT
- ☐ EXCELLENT [7]
- ☐ GOOD [5]
- ☐ FAIR [3]
- ☐ POOR [1]

CHANNELIZATION
- ☐ NONE [6]
- ☐ RECOVERED [4]
- ☐ RECOVERING [3]
- ☐ RECENT OR NO RECOVERY [1]

STABILITY
- ☐ HIGH [3]
- ☐ MODERATE [2]
- ☐ LOW [1]

Comments

Channel 12 Maximum 20

4] BANK EROSION AND RIPARIAN ZONE
Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L R
- ☐ ☐ NONE / LITTLE [3]
- ☐ ☐ MODERATE [2]
- ☐ ☐ HEAVY / SEVERE [1]

RIPARIAN WIDTH L R
- ☐ ☐ WIDE > 50m [4]
- ☐ ☐ MODERATE 10-50m [3]
- ☐ ☐ NARROW 5-10m [2]
- ☐ ☐ VERY NARROW < 5m [1]
- ☐ ☐ NONE [0]

FLOOD PLAIN QUALITY L R
- ☐ ☐ FOREST, SWAMP [3]
- ☐ ☐ SHRUB OR OLD FIELD [2]
- ☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
- ☐ ☐ FENCED PASTURE [1]
- ☐ ☐ OPEN PASTURE, ROWCROP [0]

L R
- ☐ ☐ CONSERVATION TILLAGE [1]
- ☐ ☐ URBAN OR INDUSTRIAL [0]
- ☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian 6 Maximum 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☐ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 1 Maximum 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average) ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
- ☐ BEST AREAS > 10cm [2]
- ☐ BEST AREAS 5-10cm [1]
- ☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
- ☐ MAXIMUM > 50cm [2]
- ☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
- ☐ STABLE (e.g., Cobble, Boulder) [2]
- ☐ MOD. STABLE (e.g., Large Gravel) [1]
- ☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
- ☐ NONE [2]
- ☐ LOW [1]
- ☐ MODERATE [0]
- ☐ EXTENSIVE [-1]

Comments

Riffle / Run 4 Maximum 8

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)
- ☐ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: ____ %GLIDE: ____
%RUN: ____ %RIFFLE: ____

Gradient 2 Maximum 10

EPA 4520

06/16/06

Additional criteria

Aquatic Biota:

Macroinvertebrates **[2]**

- -Excellent (4)
- - Good (2)
- - Fair (1)
- - Poor/None (0)

Fish/Amphibians **[0]**

- - Present (2)
- - None (0)

Big Clams **[0]**

- -Excellent (4)
- -Good (2)
- -Fair (1)
- -Poor/None (0)

Water Quality

Aqueous Chemistry **[3]**

- -Excellent (7)
- -Good (5)
- -Fair (1)
- -Poor (0)

Aesthetics **[1]**

- -Excellent (3)
- -Good (2)
- -Fair (1)
- -Poor (0)

STREAM NAME: ____Union Ditch _____ REACH ID:_____#2_______ DATE:__8/14/13__ Page 1 of 13

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS #____41.90828 N, 88.60629 W_____

REACH BOUNDARY-UPSTREAM: GPS #____41.90880 N, 88.60664 W_____

APPROX. LENGTH (ft):___200_____ TEMP. (°F): ___73______ TIME: ____11:00 AM________

RECENT RAIN: (Now, 12, 24, 48 hours, week)_____NONE_______ How much:_____0_____

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity: _____850_____mS/cm or **µS/cm** (circle one)

Temperature: _____61.5_____°F

pH:___7.65______

Nitrate:	90.4	%	18	mg/L
Nitrite:	88.4	%	.11	mg/L
Phosphate:	59.4	%	1.34	mg/L
Sulfide:	91.5	%	.1	mg/L
Sulfate:	98.4	%	>1	mg/L
Ammonia	13.2	%	< 5.8	mg/L
Turbidity	37.7	%	135	NTU

WATER COLOR: CLEAR__[X]___ BROWN_____ GREEN_____ GRAY______

Water Clarity: <6in __[X]___ 6-12in _____ 12-18in ______ >18in ______

Aesthetics:

Foam/scum _____ Oil sheen __[X]___ Trash/litter _____ Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor __[X]____

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes____[X]______ No____________

STREAM NAME: ____Union Ditch_____ REACH ID:_____#2______ DATE:__8/14/13__ Page 2 of 13

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes __[X]_____ No ________

Mayflies: __*___ Caddisflies: _____ Dragonflies:__*___ Damselflies:__*__

Snails: __*___ Amphipods: _____ Isopods: __*__ Leeches: _____

Worms:_____ Water Pennies: _____ Beetles: __*___ Crayfish:____

Other: Plankton, corixid (see notes)

Fish: Observed Yes ___[X]____ No ________

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: __Fish larva___

Birds: Observed Yes _______ No ________

Ducks: _____ Geese: _____ Herons: _____ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______

Others:____

REPTILES:____

AMPHIBIANS:____________Frog____

MAMMALS:________Short-tailed shrew____

STREAM NAME: ____Union Ditch _____ REACH ID:_____#2_______ DATE:__8/14/13__ Page 3 of 13

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

	No	**Yes (how many)**	**GPS#**
0- 10ft	N/A survey not conducted		
10- 20ft			
20- 30ft			
30-40ft			
40-50ft			
50-60ft			
60-70ft			
70- 80ft			
80- 90ft			
90-100ft			
100- 110ft			
110- 120ft			
120- 130ft			
130- 140ft			
140- 150ft			
150- 160ft			
160- 170ft			
170- 180ft			
180- 190ft			
190- 200ft			

STREAM NAME: ____Union Ditch _____ REACH ID:_____#2_______ DATE:__8/14/13__ Page 4 of 13

Channel Conditions measured at 50ft intervals

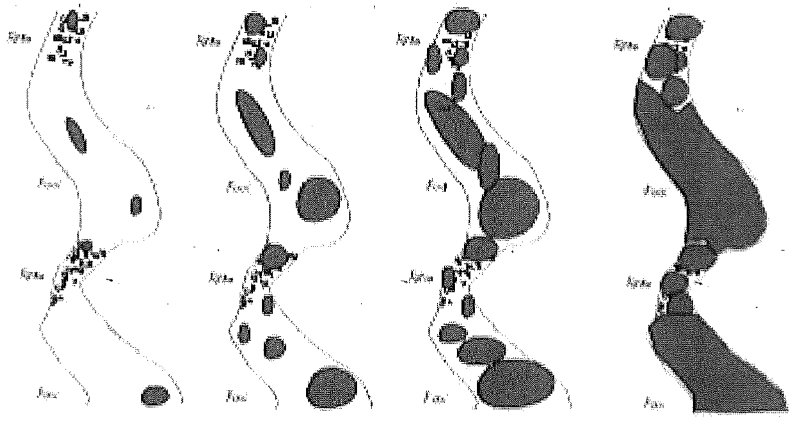
BANK HEIGHT (ft)	HEIGHT (FT) L/R	GPS #
0	1’2” / 1’6”	41.90828 N, 88.60629 W
50	10” / 1’10”	41.90856 N, 88.60618 W
100	1’4”/ 1’4”	41.90866 N, 88.60631 W
150	3’8”/ 2’3”	41.90857 N, 88.60619 W
200	1’0”/ 2’4”	41.90880 N 88.60664W
BANK SLOPE (RUN/RISE) ft	SLOPE L/R	GPS #
0	85 / 52	
50	88 / 67	
100	89 / 42	
150	74 / 47	
200	81 / 27.5	
WATER DEPTH (ft)	DEPTH (FT)	GPS #
0	3” / 3”	
50	2” / 0.5”	
100	2” / 3.5”	
150	2” / 2”	
200	2” / 2”	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	12.2	
50	8.9	
100	8.0	
150	17.5	
200	11.4	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	5.0	
50	6.3	
100	6.5	
150	4.8	
200	6.5	

Channel Flow (Stream Stage):

NONE	***LOW***	MODERATE	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	Moderate	***Low***	None
Development	Excellent	Good	***Fair***	Poor
Channelization	***None***	Recovered	Recovering	Recent or No Recovery
Stability	***High***	Moderate	Low	

Embeddedness



STREAM NAME: ____Union Ditch _____REACH ID:_____#2______ DATE:__8/14/13__ Page 6 of 13

Pool /Riffle Development: Pool __0___ % Riffle __0____ % Run __100_% Glide _0__ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth

	Best Areas > 10cm
	Best Areas 5 - 10 cm
X	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
X	Maximum < 50 cm

Riffle / Run Substrate

	Stable (Cobble, boulder)
X	Mod. Stable (Large gravel)
X	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

X	None
	Low
	Moderate
	Extensive

Degree of Bank Erosion:

NONE	***LOW***	MODERATE	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW ___[X]__ MODERATE _____ HIGH ____
OVERBANK: LOW ___[X]__ MODERATE _____ HIGH _____

Impounded: YES:_______ NO:___[X]______

Mid-Stream Bars and Islands: Yes:_______ No:___[X]___

Types and Locations of High Cases: ______________N/A__________________________

NONE	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

STREAM NAME: ____Union Ditch_____ REACH ID:_____#2_______ DATE:__8/14/13__ Page 8 of 13

Degree of Armoring: ***NONE*** LOW MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	
Boulder	
Cobble	
Gravel	
Sand	
Bedrock	

Other Types

Hardpan	
Detritus	
Muck	
Silt	
Artificial	

Origin

Limestone		Rip/Rap	
Tills		Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	
Moderate	X
Normal	
Free	

Embeddedness

Extensive	
Moderate	X
Normal	
None	

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (sec/ft)	GPS#
0	0	
50	0	
100	0	
150	0	
200	0	

STREAM NAME:____Union Ditch _____ REACH ID:_____#2_______DATE:__8/14/13__

Instream Cover:

Check all that apply

Undercut Banks		Pools > 70 cm		Aquatic Macrophytes	X
Overhanging Vegetation	X	Rootwads		Oxbows, Backwaters	
Shallows (in slow water)		Boulders		Logs or woody Debris	
Rootmats					

Amount

Extensive > 75%	X
Moderate 25 - 75%	X
Sparse 5 - < 25%	
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent:____ Rooted Submergent:_____ Rooted Floating:____

Free Floating:_____ Floating Algae:__10% Attached Algae:____ No Vegetation:__90%__

Notes: Rice Cut Grass dominated and choked channel with no flow, low water.

Field upstream aerial sprayed 8/4/13

Floodplain Vegetation and Landuse(within 100 ft of stream)

Dominant Land Use (%):

Left: Agricultural:______ Open Space:__100%__ Recreational: ______
Commercial/Industrial:______ Residential:______ Other:______

Right: Agricultural:___100%___ Open Space:______ Recreational:______
Commercial/Industrial:_____ Residential:______ Other:______

Land Cover (%):

Left: Trees: ___60___ Lawn:______ Wetlands:______ Crops:______ Shrubs:___20___
Herbaceous: ___20___ Impervious:______ Water:______ Other: ______

Right: Trees: ______ Lawn:______ Wetlands:______ Crops:__90____ Shrubs:______
Herbaceous: ___10___ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	**Moderate**	**Narrow**	**Very Narrow**	**None**
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:			X	
Left Bank:	X			

Bank Vegetation (within 10 ft of stream): ***Predominant Vegetation:***

Left Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:__X_ Shrub:_X__ Crop:___
Herbaceous: _X__ None:___ Other:_____

Right Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:___ Shrub:___ Crop:_X__
Herbaceous: __X_ None:___ Other:_____

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows____ Box Elder__X__ Honeysuckle_X__ Buckthorn___ Hardwoods___ Other___

STREAM NAME: ____Union Ditch _____ REACH ID:_____#2_______ DATE:__8/14/13__ Page 12 of 13

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)
					None

STREAM NAME: ____Union Ditch ____ REACH ID:_____#2______ DATE:__8/14/13__ Page 13 of 13

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
Culvert - concrete	Diameter - 5'10"	***		***	Found just aft of stream site

*42/120

Ohio EPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 35 poor

Stream & Location: Union Ditch #2 *RM:* ____ *Date:* __/__/06

______ *Scorers Full Name & Affiliation:* ______

River Code: __-___-___ *STORET #:* ______ *Lat./Long.:* (NAD 83 - decimal °) __.______ /8_.______ Office verified location ☐

1] *SUBSTRATE*

Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___
☐ ☐ BOULDER [9]	___	___	☐ ☐ DETRITUS [3]	___	___
☐ ☐ COBBLE [8]	___	___	☐ ☐ MUCK [2]	___	___
☐ ☐ GRAVEL [7]	___	___	☐ ☐ SILT [2]	___	___
☐ ☐ SAND [6]	___	___	☐ ☐ ARTIFICIAL [0]	___	___
☐ ☐ BEDROCK [5]	___	___			

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate -2 Maximum 20

2] *INSTREAM COVER*

Indicate presence 0 to 3: 0-Absent; 1-very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

- ___ UNDERCUT BANKS [1]
- ___ OVERHANGING VEGETATION [1]
- ___ SHALLOWS (IN SLOW WATER) [1]
- ___ ROOTMATS [1]
- ___ POOLS > 70cm [2]
- ___ ROOTWADS [1]
- ___ BOULDERS [1]
- ___ OXBOWS, BACKWATERS [1]
- ___ AQUATIC MACROPHYTES [1]
- ___ LOGS OR WOODY DEBRIS [1]

AMOUNT

Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover 9 Maximum 20

3] *CHANNEL MORPHOLOGY*

Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel 14 Maximum 20

4] *BANK EROSION AND RIPARIAN ZONE*

Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian

Comments

Riparian 0 Maximum 10

5] *POOL / GLIDE AND RIFFLE / RUN QUALITY*

MAXIMUM DEPTH

Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH

Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY

Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☐ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential

Primary Contact

Secondary Contact

(circle one and comment on back)

Comments

Pool / Current -1 Maximum 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average) ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run 4 Maximum 8

6] *GRADIENT* (ft/mi)

DRAINAGE AREA (mi²)

- ☐ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: ( ) %GLIDE: ( )

%RUN: ( ) %RIFFLE: ( )

Gradient 2 Maximum 10

EPA 4520 06/16/06

Additional criteria

Aquatic Biota:

Macroinvertebrates **[0]**

-Excellent (4)
- Good (2)
- Fair (1)
- Poor/None (0)

Fish/Amphibians **[2]**
- Present (2)
- None (0)

Big Clams **[0]**
-Excellent (4)
-Good (2)
-Fair (1)
-Poor/None (0)

Water Quality

Aqueous Chemistry **[5]**

-Excellent (7)
-Good (5)
-Fair (1)
-Poor (0)

Aesthetics **[1]**

-Excellent (3)
-Good (2)
-Fair (1)
-Poor (0)

STREAM NAME:______Union Ditch ____ REACH ID:_____#3______ DATE:_8/17/13_ Page 1 of 13

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS #_41.93259 N, 88.63012 W__

REACH BOUNDARY-UPSTREAM: GPS #___41.93277 N, 88.62940 W___

APPROX. LENGTH (ft):_200ft____ TEMP. (°F): ____71.2_____ TIME: ____8:38 AM_______

RECENT RAIN: (Now, 12, 24, 48 hours, week)________None_______ How much:_____0________

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity: ___715___ **µS/cm**

Temperature: ___20 °C_____

pH:_____7.94____

Dissolved oxygen: ___6.45____ mg/L
Nitrate: ___110____ % ______<8_____mg/L
Nitrite: ____106_____ % ____<0.05___mg/L
Phosphate: _____79.3__ % __0.6_____mg/L
Sulfide: __93.2___ % ____<0.1__mg/L
Sulfate: ___10.6__ % _____82____mg/L
Ammonia ___95.6_% ___<0.03___mg/L
Turbidity___97.8__% _____4____NTU

WATER COLOR: CLEAR_____ BROWN_____ GREEN_____ GRAY_____
Water Clarity: <6in _____ 6-12in _____ 12-18in ______ >18in ______

Aesthetics:
Foam/scum _____ Oil sheen _____ Trash/litter _____ Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor ______

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes____X______ No____________

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes ___X___ No ________

Mayflies: __X__ Caddisflies: __X__ Dragonflies:__X_ Damselflies:__X__

Snails: __X___ Amphipods: __X___ Isopods: _____ Leeches: _____

Worms:__X__ Water Pennies: _____ Beetles: __X___ Crayfish:__X__

Other:___Caddi-pupal case, pollywogs in myriophyllus, zooplankton, mosquito larvae, corixids,__ (see notes)

Fish: Observed Yes ___X____ No ________

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: _____

Birds: Observed Yes _______ No ________ (N/A)

Ducks: _____ Geese: _____ Herons: _____ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______

Others:____

REPTILES:____

AMPHIBIANS:____

MAMMALS:____

STREAM NAME:______Union Ditch ____ REACH ID:_____#3_______ DATE:_8/17/13_ Page 3 of 13

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

	No	**Yes (how many)**	**GPS#**
0- 10ft		1	
10- 20ft		1	
20- 30ft	X		
30-40ft	X		
40-50ft		1	
50-60ft		1	
60-70ft	X		
70- 80ft	X		
80- 90ft		1	
90-100ft		1	
100- 110ft		1	
110- 120ft		2	
120- 130ft		1	
130- 140ft		2	
140- 150ft		4	
150- 160ft		3	
160- 170ft		5	
170- 180ft	X		
180- 190ft		2	
190- 200ft		5	

STREAM NAME:______Union Ditch ____ REACH ID:_____#3_______ DATE:_8/17/13_ Page 4 of 13

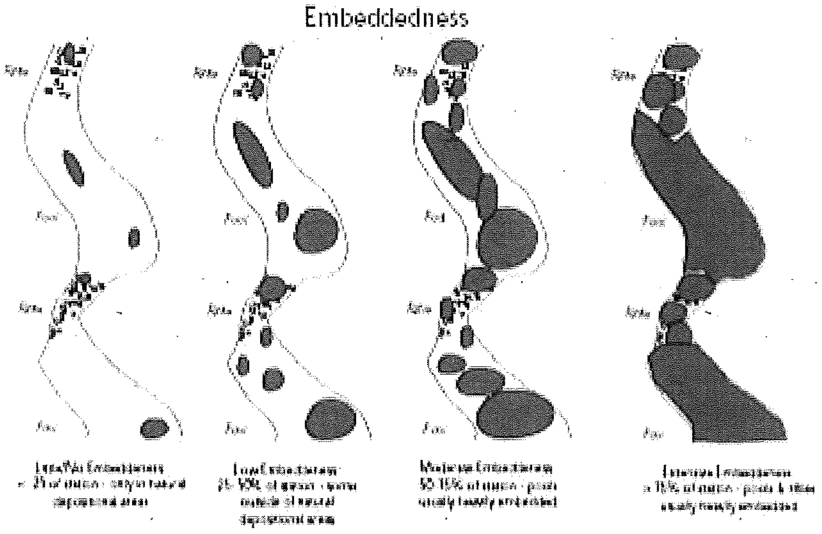
Channel Conditions measured at 50ft intervals

BANK HEIGHT (ft)	HEIGHT (FT) L/R	GPS #
0	1’5” / 2’3”	41.93259N, 88.63012W
50	1’5” / 1’6”	41.93262N, 88.62992W
100	3’4” / 2’6”	41.93273N, 88.62975W
150	1’6” / 1’10”	41.93272N, 88.62956W
200	1’7” / 4’3”	41.93277N, 88.62940W
BANK SLOPE (RUN/RISE) ft	SLOPE L/R	GPS #
0	29 / 66	
50	22 / 52	
100	44 / 42	
150	14 / 29	
200	61 / 47	
WATER DEPTH (ft)	DEPTH (FT) L/R	GPS #
0	2’5” / 0.5”	
50	2” / 1”	
100	3” / 2”	
150	1’5” / 1”	
200	4” / 1’5”	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	46.0	
50	42.2	
100	37.2	
150	33.1	
200	33.2	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	41.2	
50	38.7	
100	31.1	
150	26.7	
200	27.9	

Channel Flow (Stream Stage):

NONE	LOW	MODERATE ***	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	Moderate	Low	None ***
Development	Excellent	Good	Fair	Poor ***
Channelization	None	Recovered	Recovering **	Recent or No Recovery
Stability	High***	Moderate	Low	



Pool /Riffle Development: Pool ___0__ % Riffle __0____ % Run _100_% Glide _0__ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth

	Best Areas > 10cm
	Best Areas 5 - 10 cm
X	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
X	Maximum < 50 cm

Riffle / Run Substrate

	Stable (Cobble, boulder)
	Mod. Stable (Large gravel)
X	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

	None
X	Low
X	Moderate
	Extensive

Degree of Bank Erosion:

NONE	LOW ****	MODERATE	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; “raw” areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW __X___ MODERATE _____ HIGH ____
OVERBANK: LOW __X___ MODERATE _____ HIGH _____

Impounded: YES:_______ NO:____X_____

Mid-Stream Bars and Islands: Yes:_______ No:__X____

Types and Locations of High Cases: ____

NONE ***	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

STREAM NAME:______Union Ditch ____ REACH ID:_____#3_______ DATE:_8/17/13_ Page 8 of 13

Degree of Armoring: **(NONE***)** LOW MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	
Boulder	
Cobble	
Gravel	
Sand	
Bedrock	

Other Types

Hardpan	
Detritus	
Muck	
Silt	
Artificial	

Origin

Limestone		Rip/Rap	
Tills		Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	
Moderate	X
Normal	
Free	

Embeddedness

Extensive	
Moderate	X
Normal	
None	

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (m/S)	GPS#
0	0	
50	0	
100	0	
150	0	
200 *(180)	0.05	

Notes: Slow flowing at detection level.

Instream Cover:

Check all that apply

STREAM NAME:______Union Ditch____ REACH ID:_____#3______ DATE:_8/17/13_ Page 10 of 13

Undercut Banks		Pools > 70 cm		Aquatic Macrophytes	X
Overhanging Vegetation		Rootwads	X	Oxbows, Backwaters	
Shallows (in slow water)		Boulders		Logs or woody Debris	X
Rootmats	X				

Amount

Extensive > 75%	
Moderate 25 - 75%	
Sparse 5 - < 25%	X
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent:__10__ Rooted Submergent:__10_ Rooted Floating:_0__

Free Floating:__0__ Floating Algae:__5__ Attached Algae:__5__ No Vegetation:__70__

STREAM NAME:______Union Ditch____ REACH ID:_____#3_______ DATE:_8/17/13_ Page 11 of 13

Floodplain Vegetation and Landuse (within 100 ft of stream)

Dominant Land Use (%):

Left: Agricultural:___100___ Open Space:______ Recreational: ______
Commercial/Industrial:______ Residential:______ Other:______

Right: Agricultural:__100____ Open Space:______ Recreational:______
Commercial/Industrial:_____ Residential:______ Other:______

Land Cover (%):

Left: Trees: ______ Lawn:______ Wetlands:______ Crops:___50___ Shrubs:______
Herbaceous: ___50___ Impervious:______ Water:______ Other: ______

Right: Trees: ______ Lawn:______ Wetlands:______ Crops:___80___ Shrubs:______
Herbaceous: ___20___ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	**Moderate**	**Narrow**	**Very Narrow**	**None**
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:	X			
Left Bank:	X			

Bank Vegetation (within 10 ft of stream): ***Predominant Vegetation:***

Left Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:___ Shrub:___ Crop:___
Herbaceous: _X__ None:___ Other:_____

Right Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:___ Shrub:___ Crop:___
Herbaceous: _X__ None:___ Other:_____

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows____ Box Elder____ Honeysuckle___ Buckthorn___ Hardwoods___ Other___

STREAM NAME:______Union Ditch ____ REACH ID:_____#3_______ DATE:_8/17/13_ Page 12 of 13

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)
					Just south of site, discharge
					Silt bed divides half of stream at bridge

STREAM NAME:______Union Ditch ____ REACH ID:_____#3_______ DATE:_8/17/13_ Page 13 of 13

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
					None

'38/120

Ohio EPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 26 Very poor

Stream & Location: Union Ditch #3 *RM:* _ _ . _ *Date:* _ _/ _ _/ 06

________ *Scorers Full Name & Affiliation:* ________

River Code: _ _ - _ _ _ - _ _ _ *STORET #:* ______ *Lat./ Long.:* (NAD 83 - decimal °) _ _ . _ _ _ _ _ /8 _ . _ _ _ _ _ Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]	___	___	☐☐ HARDPAN [4]	___	___
☐☐ BOULDER [9]	___	___	☐☐ DETRITUS [3]	___	___
☐☐ COBBLE [8]	___	___	☐☐ MUCK [2]	___	___
☐☐ GRAVEL [7]	___	___	☐☐ SILT [2]	___	___
☐☐ SAND [6]	___	___	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2]
☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
☐ LIMESTONE [1]
☐ TILLS [1]
☐ WETLANDS [0]
☐ HARDPAN [0]
☐ SANDSTONE [0]
☐ RIP/RAP [0]
☐ LACUSTURINE [0]
☐ SHALE [-1]
☐ COAL FINES [-2]

QUALITY
SILT
☐ HEAVY [-2]
☐ MODERATE [-1]
☐ NORMAL [0]
☐ FREE [1]

EMBEDDEDNESS
☐ EXTENSIVE [-2]
☐ MODERATE [-1]
☐ NORMAL [0]
☐ NONE [1]

Substrate Maximum 20: -2

2] INSTREAM COVER
Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
____ POOLS > 70cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
____ LOGS OR WOODY DEBRIS [1]

AMOUNT
Check ONE (Or 2 & average)
☐ EXTENSIVE >75% [11]
☐ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 7

3] CHANNEL MORPHOLOGY
Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 8

4] BANK EROSION AND RIPARIAN ZONE
Check ONE in each category for EACH BANK (Or 2 per bank & average)
River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☐☐ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☐☐ NARROW 5-10m [2]	☐☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	Indicate predominant land use(s) past 100m riparian.
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Comments

Riparian Maximum 10: 8

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check ONE (ONLY!)
☐ > 1m [6]
☐ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (Or 2 & average)
☐ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
☐ TORRENTIAL [-1]
☐ VERY FAST [1]
☐ FAST [1]
☐ MODERATE [1]
☐ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 1

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average) ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
☐ BEST AREAS > 10cm [2]
☐ BEST AREAS 5-10cm [1]
☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
☐ MAXIMUM > 50cm [2]
☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
☐ STABLE (e.g., Cobble, Boulder) [2]
☐ MOD. STABLE (e.g., Large Gravel) [1]
☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ NONE [2]
☐ LOW [1]
☐ MODERATE [0]
☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 2

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)
☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: ___ %GLIDE: ___
%RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 2

EPA 4520 06/16/06

Additional criteria

<u>Aquatic Biota</u>:

Macroinvertebrates **[1]**

-Excellent (4)
- Good (2)
- Fair (1)
- Poor/None (0)

Fish/Amphibians **[2]**
- Present (2)
- None (0)

Big Clams **[2]**
-Excellent (4)
-Good (2)
-Fair (1)
-Poor/None (0)

<u>Water Quality</u>

Aqueous Chemistry **[5]**

-Excellent (7)
-Good (5)
-Fair (1)
-Poor (0)

Aesthetics **[2]**

-Excellent (3)
-Good (2)
-Fair (1)
-Poor (0)

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 1 of 13

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS #___41.92420, 88.56086______

REACH BOUNDARY-UPSTREAM: GPS #____41.92425, 88.56052________

APPROX. LENGTH (ft):____200____ TEMP. (◦F): ____71_____ TIME: _____9:00 AM_________

RECENT RAIN: (Now, 12, 24, 48 hours, week)______24 hours_________ How much:____0.05"________

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity: _____n/a___ mS/cm or µS/cm (circle one)

Temperature: ____24____ °C

pH:____8.04____

Nitrate:	____93.1_____ %	_____n/a_____mg/L
Nitrite:	_____98.8____ %	______< .05______mg/L
Phosphate:	____47.9_____ %	_____1.89_____mg/L
Sulfide:	___92.1_____ %	____0.1______mg/L
Sulfate:	___23_____ %	______71_____mg/L
Ammonia	___73.4____%	______0.21_____mg/L
Turbidity	_____92.1____%	______12_____NTU

WATER COLOR: CLEAR__X__ BROWN_____ GREEN_____ GRAY______

Water Clarity: <6in __CTB___ 6-12in _____ 12-18in ______ >18in ______

Aesthetics:

Foam/scum _____ Oil sheen _____ Trash/litter __*minimal*___ Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor ______

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes_____X_____ No____________

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes ___X____ No ________

Mayflies: __X___ Caddisflies: _____ Dragonflies:__X__ Damselflies:__X_

Snails: __X___ Amphipods: __X___ Isopods: __X___ Leeches: _____

Worms:___X__ Water Pennies: _____ Beetles: __X___ Crayfish:____

Other:__X (see notes)___

Fish: Observed Yes ___X____ No ________

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: _____

Birds: Observed Yes __X_____ No ________

Ducks: _____ Geese: _____ Herons: __X___ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______ Others:_______Blue Jay, Cardinal (see notes)________________________

REPTILES:____

AMPHIBIANS:____

MAMMALS:__________Chipmunk____

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 3 of 13

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

	No	Yes (how many)	GPS#
0- 10ft	N/a		
10- 20ft			
20- 30ft			
30-40ft			
40-50ft			
50-60ft			
60-70ft			
70- 80ft			
80- 90ft			
90-100ft			
100- 110ft			
110- 120ft			
120- 130ft			
130- 140ft			
140- 150ft			
150- 160ft			
160- 170ft			
170- 180ft			
180- 190ft			
190- 200ft			

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 4 of 13

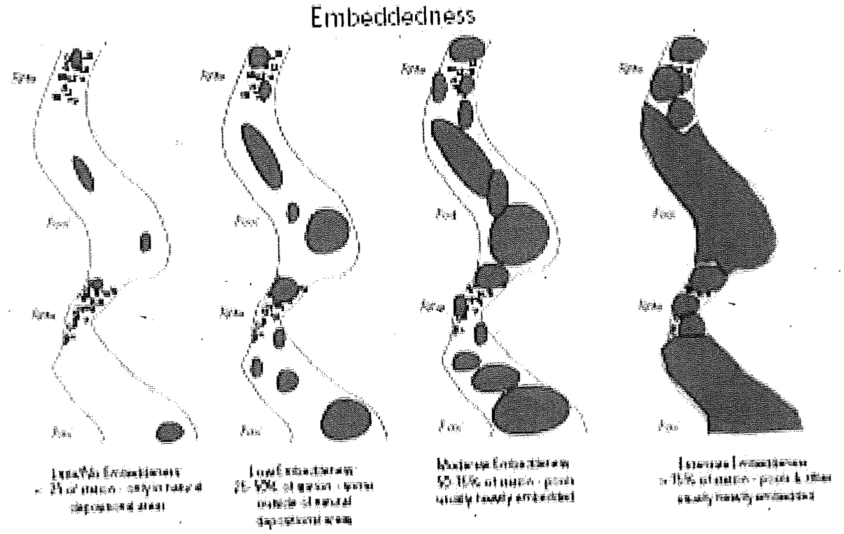
Channel Conditions measured at 50ft intervals

BANK HEIGHT (ft)	HEIGHT (FT) L/R	GPS #
0	1’9” / 2’6”	41.92420 , 88.56086
50	1’9” / 2’8”	41.92434 , 88.56076
100	3’6” / 3’2”	41.92435 / 88.56054
150	3’3” / 3’2”	41.92414 / 88.56045
200	2’6” / 2’4”	41.92425 / 88.56052
BANK SLOPE (RUN/RISE) ft	SLOPE L/R	GPS #
0	24 / 61	
50	49 / 34	
100	35 / 32	
150	84 / 41	
200	39 / 25	
WATER DEPTH (ft)	DEPTH (FT) L/R	GPS #
0	0” / 0”	
50	0”/ 0”	
100	2” / 0”	
150	1.5” / 0”	
200	1” / 0”	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	28.0	
50	28.2	
100	33.4	
150	27.8	
200	25.6	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	23.0	
50	21.5	
100	14.3	
150	13.8	
200	15.7	

Channel Flow (Stream Stage):

NONE	***LOW***	MODERATE	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	Moderate	Low	***None***
Development	Excellent	Good***	***Fair	Poor
Channelization	None	Recovered	Recovering	**Recent or No Recovery
Stability	High	***Moderate***	Low	



STREAM NAME:______Virgil Ditch__ REACH ID:______#1_____ DATE:__9/7/13 Page 6 of 13

Pool /Riffle Development: Pool __0___ % Riffle __0___ % Run __100_% Glide __0_ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth

	Best Areas > 10cm
	Best Areas 5 - 10 cm
X	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
X	Maximum < 50 cm

Riffle / Run Substrate

	Stable (Cobble, boulder)
	Mod. Stable (Large gravel)
X	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

	None
	Low
	Moderate
X	Extensive

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 7 of 13

Degree of Bank Erosion:

NONE	LOW	***MODERATE***	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW _____ MODERATE __X___ HIGH ____
OVERBANK: LOW __X___ MODERATE ___X__ HIGH _____

Impounded: YES:___X____ NO:_________

Mid-Stream Bars and Islands: Yes:_______ No:__X____

Types and Locations of High Cases: ______________________________

NONE ***	LOW	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 8 of 13

Degree of Armoring: ***NONE*** LOW MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	
Boulder	X
Cobble	
Gravel	
Sand	
Bedrock	

Other Types

Hardpan	
Detritus	
Muck	X
Silt	X
Artificial	

Origin

Limestone		Rip/Rap	
Tills		Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	X
Moderate	X
Normal	
Free	

Embeddedness

Extensive	X
Moderate	
Normal	
None	

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 9 of 13

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (sec/ft)	GPS#
0	n/a	
50		
100		
150		
200		

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 10 of 13

Instream Cover:

Check all that apply

Undercut Banks		Pools > 70 cm		Aquatic Macrophytes	
Overhanging Vegetation	X	Rootwads	X	Oxbows, Backwaters	
Shallows (in slow water)	X	Boulders	X	Logs or woody Debris	X
Rootmats	X				

Amount

Extensive > 75%	X
Moderate 25 - 75%	X
Sparse 5 - < 25%	
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent:_40%__ Rooted Submergent:_____ Rooted Floating:____

Free Floating:____ Floating Algae:____ Attached Algae:____ No Vegetation:__60%___

STREAM NAME:_____Virgil Ditch__ REACH ID:______#1______ DATE:_9/7/13 Page 11 of 13

Floodplain Vegetation and Land use (within 100 ft of stream)

Dominant Land Use (%):

Left: Agricultural:___75%___ Open Space:______ Recreational: ______
Commercial/Industrial:______ Residential:______ Other:___25% wooded___

Right: Agricultural:__62%____ Open Space:______ Recreational:______
Commercial/Industrial:_____ Residential:______ Other:___38% wooded___

Land Cover (%):
Left: Trees: __20%____ Lawn:______ Wetlands:______ Crops:__75%____ Shrubs:______
Herbaceous: __5%____ Impervious:______ Water:______ Other: ______

Right: Trees: ___30%___ Lawn:______ Wetlands:______ Crops:__62%___ Shrubs:______
Herbaceous: ___8%___ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	Moderate	Narrow	Very Narrow	None
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:	X			
Left Bank:	X			

Bank Vegetation (within 10 ft of stream): ***Predominant Vegetation:***

Left Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:_X__ Shrub:_X__ Crop:___
Herbaceous: _X__ None:___ Other:_____

Right Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:_X__ Shrub:_X__ Crop:___
Herbaceous: _X__ None:___ Other:_____

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows____ Box Elder_X__ Honeysuckle_X_ Buckthorn_X__ Hardwoods___ Other_X__

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 12 of 13

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)

STREAM NAME:______Virgil Ditch__ REACH ID:______#1______ DATE:__9/7/13 Page 13 of 13

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
					Fallen trees, causing blockage

*48/120

OhioEPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 37 poor

Stream & Location: Virgil Ditch #1 *RM:* ___.__ *Date:* __/__/06

Scorers Full Name & Affiliation: ____________

River Code: __-___-___ *STORET #:* ______ *Lat./ Long.:* __.______ /8__.______ Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]	____	____	☐ ☐ HARDPAN [4]	____	____
☐ ☐ BOULDER [9]	____	____	☐ ☐ DETRITUS [3]	____	____
☐ ☐ COBBLE [8]	____	____	☐ ☐ MUCK [2]	____	____
☐ ☐ GRAVEL [7]	____	____	☐ ☐ SILT [2]	____	____
☐ ☐ SAND [6]	____	____	☐ ☐ ARTIFICIAL [0]	____	____
☐ ☐ BEDROCK [5]	____	____			

(Score natural substrates; ignore sludge from point-sources)

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
- ☐ LIMESTONE [1]
- ☐ TILLS [1]
- ☐ WETLANDS [0]
- ☐ HARDPAN [0]
- ☐ SANDSTONE [0]
- ☐ RIP/RAP [0]
- ☐ LACUSTURINE [0]
- ☐ SHALE [-1]
- ☐ COAL FINES [-2]

QUALITY

SILT
- ☐ HEAVY [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ FREE [1]

EMBEDDEDNESS
- ☐ EXTENSIVE [-2]
- ☐ MODERATE [-1]
- ☐ NORMAL [0]
- ☐ NONE [1]

Substrate 8 Maximum 20

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

____ UNDERCUT BANKS [1]
____ OVERHANGING VEGETATION [1]
____ SHALLOWS (IN SLOW WATER) [1]
____ ROOTMATS [1]
____ POOLS > 70cm [2]
____ ROOTWADS [1]
____ BOULDERS [1]
____ OXBOWS, BACKWATERS [1]
____ AQUATIC MACROPHYTES [1]
____ LOGS OR WOODY DEBRIS [1]

AMOUNT

Check ONE (Or 2 & average)
- ☐ EXTENSIVE >75% [11]
- ☐ MODERATE 25-75% [7]
- ☐ SPARSE 5-<25% [3]
- ☐ NEARLY ABSENT <5% [1]

Comments

Cover 13 Maximum 20

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel 8 Maximum 20

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	Indicate predominant land use(s) past 100m riparian.
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Comments

Riparian 7 Maximum 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH

Check ONE (ONLY!)
- ☐ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH

Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☐ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY

Check ALL that apply
- ☐ TORRENTIAL [-1] ☐ SLOW [1]
- ☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
- ☐ FAST [1] ☐ INTERMITTENT [-2]
- ☐ MODERATE [1] ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current -1 Maximum 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average)

☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run 0 Maximum 8

6] GRADIENT (ft/mi) ☐ VERY LOW - LOW [2-4]
DRAINAGE AREA (mi²) ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: ( ) %GLIDE: ( )
%RUN: ( ) %RIFFLE: ( )

Gradient 2 Maximum 10

Additional criteria

Aquatic Biota:

Macroinvertebrates **[1]**

-Excellent (4)
- Good (2)
- Fair (1)
- Poor/None (0)

Fish/Amphibians **[2]**
- Present (2)
- None (0)

Big Clams **[0]**
-Excellent (4)
-Good (2)
-Fair (1)
-Poor/None (0)

Water Quality

Aqueous Chemistry **[5]**

-Excellent (7)
-Good (5)
-Fair (1)
-Poor (0)

Aesthetics **[1]**

-Excellent (3)
-Good (2)
-Fair (1)
-Poor (0)

STREAM NAME:_____Virgil_Ditch______ REACH ID:__#2_____ DATE:___9/28/13_ Page 1 of 13

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS #___41.94329 N, 88.53231 W______

REACH BOUNDARY-UPSTREAM: GPS #____41.94382 N, 88.53228 W________

APPROX. LENGTH (ft):____200____ TEMP. (·F): ____70.3_____ TIME: _____10:00 am________

RECENT RAIN: (Now, 12, 24, 48 hours, week)_______24 hours________ How much:____0.19"________

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity: ____718__ mS/cm or **µS/cm** (circle one)

Temperature: ___15.3___ ^{oC}

pH:__5.81____

Nitrate: ____46.6___ % _____117_____mg/L
Nitrite: ____92.4___ % ____0.05______mg/L
Phosphate: ____72.6___ % _____0.85_____mg/L
Sulfide: ___93.8_____ % _____0.1_____mg/L
Sulfate: ___21.1_____ % _____73_____mg/L
Ammonia __54.3_____% ______1.51____mg/L
Turbidity___96.7_____% _____6_____NTU

WATER COLOR: CLEAR___X__ BROWN_____ GREEN_____ GRAY______
Water Clarity: <6in _____ 6-12in __X___ 12-18in ______ >18in ______

Aesthetics:
Foam/scum _____ Oil sheen _____ Trash/litter _____ Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor __X____

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes_____X_____ No____________

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes __X_____ No ________

Mayflies: _____ Caddisflies: _____ Dragonflies:__X___ Damselflies:__X___

Snails: __X___ Amphipods: __X___ Isopods: _____ Leeches: __X___

Worms:_____ Water Pennies: _____ Beetles: __X___ Crayfish:__X__

Other:__X (see notes)___

Fish: Observed Yes __X____ No ________

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: __Darters, Minnows___

Birds: Observed Yes _______ No ___X_____

Ducks: _____ Geese: _____ Herons: _____ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______

Others:____

REPTILES:____

AMPHIBIANS:____

MAMMALS:____

STREAM NAME:_____Virgil_Ditch______ REACH ID:___#2_____ DATE:___9/28/13_ Page 3 of 13

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

	No	Yes (how many)	GPS#
0- 10ft	X		
10- 20ft	X		
20- 30ft	X		
30-40ft	X		
40-50ft	X		
50-60ft	X		
60-70ft	X		
70- 80ft	X		
80- 90ft	X		
90-100ft	X		
100- 110ft	X		
110- 120ft	X		
120- 130ft	X		
130- 140ft	X		
140- 150ft	X		
150- 160ft	X		
160- 170ft	X		
170- 180ft	X		
180- 190ft	X		
190- 200ft	X		

STREAM NAME:_____Virgil_Ditch_____ REACH ID:___#2_____ DATE:___9/28/13_ Page 4 of 13

Channel Conditions measured at 50ft intervals

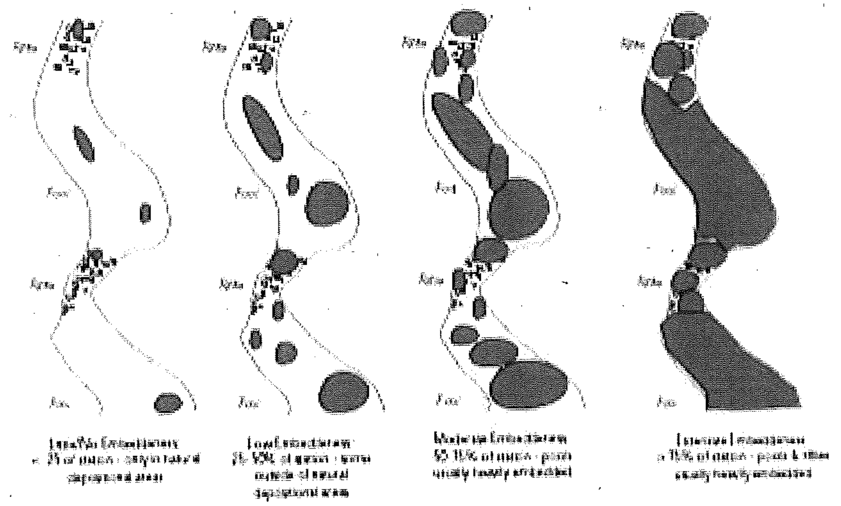
BANK HEIGHT (ft)	HEIGHT (FT) L/R	GPS #
0	3' / 3'	41.94329 N, 88.53231 W
50	3'6" / 3'6"	41.94339 N, 88.53230 W
100	2'8" / 2'	41.94357 N, 88.53230 W
150	3'6" / 3'10"	41.94359 N, 88.53229 W
200	2'8" / 3'5"	41.94382 N, 88.53228 W
BANK SLOPE (RUN/RISE) ft	SLOPE L/R	GPS #
0	43 / 75	
50	79 / 59	
100	63 / 33	
150	29 / 82	
200	33 / 78	
WATER DEPTH (ft)	DEPTH (FT) L/R	GPS #
0	2'5" / 3"	
50	4" / 2"	
100	1" / 6"	
150	1" / 2"	
200	1" / 1"	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	26.7	
50	28.2	
100	20.3	
150	25.0	
200	23.8	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	14.0	
50	15.0	
100	15.5	
150	16.6	
200	5.6	

Channel Flow (Stream Stage):

NONE	***LOW***	MODERATE	NORMAL	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	Moderate	***Low***	None
Development	Excellent	***Good***	Fair	Poor
Channelization	None	Recovered	*Recovering*	Recent or No Recovery
Stability	***High***	Moderate	Low	

Embeddedness



STREAM NAME:_____Virgil_Ditch______ REACH ID:__#2_____ DATE:___9/28/13_ Page 6 of 13

Pool /Riffle Development: Pool _____ % Riffle ___10__ % Run __90__% Glide ______ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth

	Best Areas > 10cm
	Best Areas 5 - 10 cm
X	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
X	Maximum < 50 cm

Riffle / Run Substrate

	Stable (Cobble, boulder)
	Mod. Stable (Large gravel)
X	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

X	None
	Low
	Moderate
	Extensive

STREAM NAME:_____Virgil_Ditch______ REACH ID:___#2_____ DATE:___9/28/13_ Page 7 of 13

Degree of Bank Erosion:

***NONE ***	LOW	MODERATE	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW ___X__ MODERATE _____ HIGH ____
OVERBANK: LOW _____ MODERATE __X___ HIGH _____

Impounded: YES:_______ NO:____X_____

Mid-Stream Bars and Islands: Yes:___X____ No:______

Types and Locations of High Cases: ___soil encroachment into stream at 200 ft ________

NONE	***LOW***	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

STREAM NAME:_____Virgil_Ditch_____ REACH ID:___#2_____DATE:___9/28/13_ Page 8 of 13

Degree of Armoring: NONE *** LOW*** MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	X
Boulder	X
Cobble	
Gravel	
Sand	
Bedrock	

Other Types

Hardpan	
Detritus	
Muck	
Silt	X
Artificial	

Origin

Limestone		Rip/Rap	
Tills		Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	X
Moderate	
Normal	
Free	

Embeddedness

Extensive	
Moderate	X
Normal	
None	

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (m/s)	GPS#
0	0	
50	0	
100	0	
150	0.03	
200	0.03	

STREAM NAME:_____Virgil Ditch______ REACH ID:__#2_____ DATE:___9/28/13_ Page 10 of 13

Instream Cover:

Check all that apply

Undercut Banks		Pools > 70 cm		Aquatic Macrophytes	X
Overhanging Vegetation	X	Rootwads		Oxbows, Backwaters	
Shallows (in slow water)	X	Boulders	X	Logs or woody Debris	X
Rootmats					

Amount

Extensive > 75%	
Moderate 25 - 75%	X
Sparse 5 - < 25%	
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent:____ Rooted Submergent:_____ Rooted Floating:____

Free Floating:__45% Floating Algae:____ Attached Algae:__25% No Vegetation:___30%___

Floodplain Vegetation and Land use (within 100 ft of stream)

***Dominant Land Use (%)*:**

Left: Agricultural:___100%___ Open Space:______ Recreational: ______
Commercial/Industrial:______ Residential:______ Other:______

Right: Agricultural:______ Open Space:______ Recreational:______
Commercial/Industrial:______ Residential:___100%___ Other:______

***Land Cover (%)*:**
Left: Trees: ______ Lawn:______ Wetlands:______ Crops:__90%___ Shrubs:___10%__
Herbaceous: ______ Impervious:______ Water:______ Other: ______

Right: Trees: ___10%___ Lawn:___90%___ Wetlands:______ Crops:______ Shrubs:______
Herbaceous: ______ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	**Moderate**	**Narrow**	**Very Narrow**	**None**
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:		X		
Left Bank:		X		

Bank Vegetation (within 10 ft of stream): ***Predominant Vegetation:***

Left Bank: Unmowed Grass:_X__ Lawn:___ Wetland:___ Trees:___ Shrub:___ Crop:___
Herbaceous: ___ None:___ Other:_____

Right Bank: Unmowed Grass:_X__ Lawn:___ Wetland:___ Trees:___ Shrub:___ Crop:___
Herbaceous: ___ None:___ Other:_____

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows____ Box Elder__X__ Honeysuckle___ Buckthorn___ Hardwoods___ Other___

STREAM NAME:_____Virgil_Ditch______ REACH ID:___#2_____ DATE:___9/28/13_ Page 12 of 13

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)
					None

STREAM NAME:_____Virgil_Ditch______ REACH ID:___#2_____ DATE:___9/28/13_ Page 13 of 13

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
					Armoring of concrete slabs to reinforce residential bridge on right bank

*58/120

Ohio EPA

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 54 Fair / good

Stream & Location: Virgil Ditch #2 *RM:* ___._ *Date:* __/__/ 06

________________ *Scorers Full Name & Affiliation:* ________________

River Code: __-___-___ *STORET #:* ______ *Lat./ Long.:* (NAD 83 - decimal °) __.______ /8_.______ Office verified location ☐

1] *SUBSTRATE* Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE	ORIGIN		QUALITY
☐☐ BLDR /SLABS [10]	___	___	☐ ☐ HARDPAN [4]	___	___	☐ LIMESTONE [1]	SILT	☐ HEAVY [-2]
☐☐ BOULDER [9]	___	___	☐ ☐ DETRITUS [3]	___	___	☐ TILLS [1]	SILT	☐ MODERATE [-1]
☐☐ COBBLE [8]	___	___	☐ ☐ MUCK [2]	___	___	☐ WETLANDS [0]	SILT	☐ NORMAL [0]
☐☐ GRAVEL [7]	___	___	☐ ☐ SILT [2]	___	___	☐ HARDPAN [0]	SILT	☐ FREE [1]
☐☐ SAND [6]	___	___	☐ ☐ ARTIFICIAL [0]	___	___	☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)			☐ RIP/RAP [0]	EMBEDDEDNESS	☐ MODERATE [-1]
						☐ LACUSTURINE [0]	EMBEDDEDNESS	☐ NORMAL [0]
						☐ SHALE [-1]	EMBEDDEDNESS	☐ NONE [1]
						☐ COAL FINES [-2]		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Substrate 18 Maximum 20

2] *INSTREAM COVER* Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

___ UNDERCUT BANKS [1]
___ OVERHANGING VEGETATION [1]
___ SHALLOWS (IN SLOW WATER) [1]
___ ROOTMATS [1]
___ POOLS > 70cm [2]
___ ROOTWADS [1]
___ BOULDERS [1]
___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
___ LOGS OR WOODY DEBRIS [1]

AMOUNT
Check ONE (Or 2 & average)
☐ EXTENSIVE >75% [11]
☐ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover 12 Maximum 20

3] *CHANNEL MORPHOLOGY* Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel 13 Maximum 20

4] *BANK EROSION AND RIPARIAN ZONE* Check ONE in each category for *EACH BANK* (Or 2 per bank & average)

River right looking downstream

L R EROSION	L R RIPARIAN WIDTH	L R FLOOD PLAIN QUALITY	L R
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☐☐ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☐☐ NARROW 5-10m [2]	☐☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	Indicate predominant land use(s) past 100m riparian.
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Comments

Riparian 4 Maximum 10

5] *POOL / GLIDE AND RIFFLE / RUN QUALITY*

MAXIMUM DEPTH Check ONE (ONLY!)	CHANNEL WIDTH Check ONE (Or 2 & average)	CURRENT VELOCITY Check ALL that apply	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☐ SLOW [1]
☐ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current 2 Maximum 12

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average) ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run 3 Maximum 8

6] *GRADIENT* (ft/mi) DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: %GLIDE:
%RUN: %RIFFLE:

Gradient 2 Maximum 10

Additional criteria

Aquatic Biota:

Macroinvertebrates **[1]**

-Excellent (4)
- Good (2)
- Fair (1)
- Poor/None (0)

Fish/Amphibians **[2]**
- Present (2)
- None (0)

Big Clams **[0]**
-Excellent (4)
-Good (2)
-Fair (1)
-Poor/None (0)

Water Quality

Aqueous Chemistry **[0]**

-Excellent (7)
-Good (5)
-Fair (1)
-Poor (0)

Aesthetics **[1]**

-Excellent (3)
-Good (2)
-Fair (1)
-Poor (0)

STREAM NAME: Virgil Ditch REACH ID: #3 DATE: 9/7/13 Page 1 of 13

STREAM INVENTORY REPORT FORM

REACH BOUNDARY-DOWNSTREAM: GPS # 41.93814 N, 88.55869 W

REACH BOUNDARY-UPSTREAM: GPS # 41.93775 N, 88.55821 W

APPROX. LENGTH (ft): 200 TEMP. (◦F): 80 TIME: 11:00 am

RECENT RAIN: (Now, 12, 24, 48 hours, week) 24 hours How much: 0.05"

WATER QUALITY: To be sampled from 100ft upstream of site origin. Bucket to be rinsed 3x and then sample will be acquired for testing.

Multimeter:

Conductivity: n/a mS/cm or μS/cm (circle one)

Temperature: 19.8 °C

pH: 7.64

Nitrate: 96.7 % < 8 mg/L
Nitrite: 45.4 % 0.98 mg/L
Phosphate: 80.9 % 0.56 mg/L
Sulfide: 80.1 % 0.4 mg/L
Sulfate: 11.7 % 92 mg/L
Ammonia 53.3 % 1.59 mg/L
Turbidity 91.3 % 13 NTU

WATER COLOR: CLEAR X BROWN _____ GREEN _____ GRAY _____

Water Clarity: <6in X 6-12in _____ 12-18in _____ >18in _____

Aesthetics:
Foam/scum _____ Oil sheen _____ Trash/litter X Sludge deposits _____ Excess turbidity _____ Discoloration _____ Nuisance odor _____

Pharmaceutical impact testing:

Collect samples (2 whirlpaks) from each site to place in cooler. Label each whirlpak with site name.

Collected? Yes X No _____

STREAM NAME:______Virgil Ditch _______REACH ID:_____#3______ DATE:__9/7/13_____ Page 2 of 13

AQUATIC AND TERRESTRIAL ORGANISMS:

(Check Or Note All That Were Observed.)

Macroinvertebrates: Observed Yes ___X__ No ________

Mayflies: __X__ Caddisflies: __X__ Dragonflies:__X__ Damselflies:__X___

Snails: __X__ Amphipods: _____ Isopods: _____ Leeches: _____

Worms:__X___ Water Pennies: _____ Beetles: __X___ Crayfish:__X__

Other:__(see notes)___

Fish: Observed Yes ___X____ No ________

If Observed, What Classification (If Applicable)

Carp: _____ Black Bullheads: _____ Creek Chubs: _____ Green Sunfish: _____

Bluegill:____ Largemouth Bass: _____ Johnny Darters: _____ Fathead Minnows: _____

Golden Shiners: _____ Others: __Darter, Monnows___

Birds: Observed Yes ___X____ No ________

Ducks: _____ Geese: _____ Herons: _____ Kingfishers: _____ Sandpipers/Plovers: _____

Gulls/Terns:______ Others:______Barn Swallow________________________________

REPTILES:____

AMPHIBIANS:________Frog____

MAMMALS:____

STREAM NAME:______Virgil Ditch _______ REACH ID:_____#3_______ DATE:__9/7/13_____ Page 3 of 13

Mussel Beds:

Mussel Bed search conducted within 200 ft area at 10 ft intervals.

	No	**Yes (how many)**	**GPS#**
0- 10ft	X		
10- 20ft	X		
20- 30ft	X		
30-40ft	X		
40-50ft	X		
50-60ft		3	
60-70ft	X		
70- 80ft	X		
80- 90ft	X		
90-100ft	X		
100- 110ft		1	
110- 120ft		1	
120- 130ft		1	
130- 140ft	X		
140- 150ft		1	
150- 160ft	X		
160- 170ft		3	
170- 180ft	X		
180- 190ft		2	
190- 200ft	X		

STREAM NAME:______Virgil Ditch _______ REACH ID:_____#3_______ DATE:__9/7/13_____

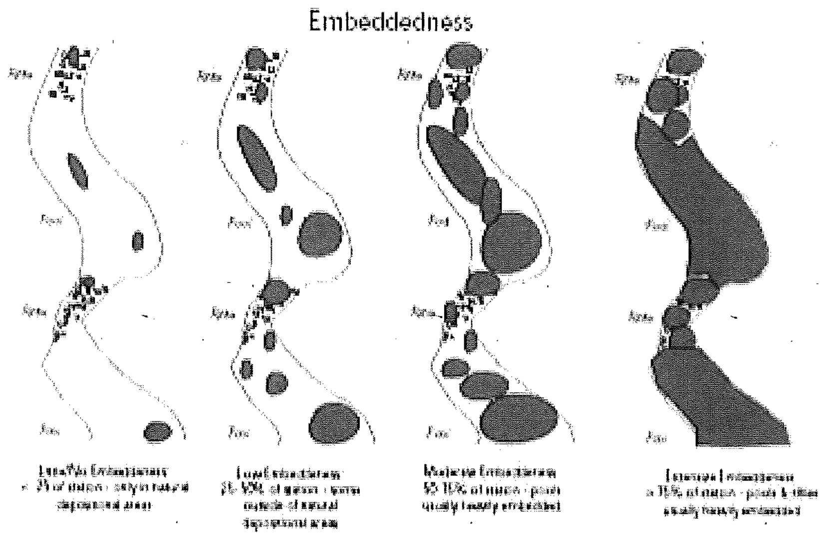
Channel Conditions measured at 50ft intervals

BANK HEIGHT (ft)	HEIGHT (FT) L/R	GPS #
0	3’6” / 2’10”	41.93814 N, 88.55869 W
50	2’6” / 2’	41.93795 N, 88.55862 W
100	2’6” / 3’	41.93786 N, 88.55858 W
150	2’8” / 2’6”	41.93781 N, 88.55846 W
200	1’7” / 3’4”	41.93775 N, 88.55821 W
BANK SLOPE (RUN/RISE) ft	SLOPE L/R	GPS #
0	83 / 25	
50	44 / 31	
100	32 / 89	
150	52 / 31	
200	22 / 39	
WATER DEPTH (ft)	DEPTH (FT) L/R	GPS #
0	0” / 1”	
50	3” / 4”	
100	0” / 0”	
150	2” / 3”	
200	0” / 0”	
TOP CHANNEL WIDTH (FT)	WIDTH (FT)	GPS #
0	30.7	
50	28.9	
100	34.4	
150	28.8	
200	31	
BOTTOM CHANNEL WIDTH (FT)	WIDTH (FT)	GPS#
0	18	
50	22.7	
100	26.5	
150	20.2	
200	19.8	

Channel Flow (Stream Stage):

NONE	LOW	MODERATE	***NORMAL ***	HIGH
Very little water in channel and mostly present as standing pools	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed	Water fills > 75% of the available channel; or <25% of channel substrate is exposed	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water levels are higher than the base of both banks

Sinuosity	High	***Moderate***	Low	None
Development	Excellent	***Good***	Fair	Poor
Channelization	None	***Recovered***	Recovering	Recent or No Recovery
Stability	High	***Moderate***	Low	



Pool /Riffle Development: Pool ___5__ % Riffle __25__ % Run __70__% Glide ______ %

Pools are generally well-defined areas of deeper than average water. Pools do not usually extend in length more than three or four times the stream width. Pools should almost immediately be followed by a riffle environment for the stream to be characterized as having high pool/riffle development.

Riffle Depth

	Best Areas > 10cm
X	Best Areas 5 - 10 cm
	Best Areas < 5 cm

Run Depth

	Maximum > 50 cm
X	Maximum < 50 cm

Riffle / Run Substrate

X	Stable (Cobble, boulder)
X	Mod. Stable (Large gravel)
X	Unstable (Fine gravel, sand)

Riffle / Run Embeddedness

X	None
X	Low
	Moderate
	Extensive

Degree of Bank Erosion:

NONE	***LOW ***	MODERATE	Heavy/Severe
Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; less than 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-33% bank has areas of erosion.	Moderately unstable; 33--66% of bank has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 66-100% of bank with erosional scars.

Stream Debris Load (Instream refers to natural and man-made debris including leaves, sticks, logs, lumber, trash, and sediment. Overbank refers to loosened, floatable materials that are prevalent enough to potentially cause debris jams at culverts and bridges during high flow events):

INSTREAM: LOW _____ MODERATE __X___ HIGH ____ (Note:Lots of glass & metal)
OVERBANK: LOW _____ MODERATE ___X__ HIGH _____

Impounded: YES:_______ NO:____X_____

Mid-Stream Bars and Islands: Yes:___X____ No:______

Types and Locations of High Cases: ____Minor boulders on riffle areas __________

NONE	***LOW ***	MODERATE	HIGH
Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment depositions	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected, sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent	Heavy deposits of fine material, increase bar development; more than 80% bottom changing frequently, pools almost absent due to substantial sediment deposition

Degree of Armoring: NONE ***LOW*** MODERATE HIGH

Armoring refers to the placement of gabions, wood, metal, riprap or other similar artificial materials along the streambank to reduce bank erosion. Low = < 30% Moderate = 33 to 66 % High = > 66% (Portions of armoring that are failing should be noted.

Describe the armoring: (Check all that apply)

Best Types

Boulder/Slabs	
Boulder	X
Cobble	X
Gravel	X
Sand	
Bedrock	

Other Types

Hardpan	
Detritus	
Muck	
Silt	X
Artificial	

Origin

Limestone		Rip/Rap	
Tills		Lacustrine	
Wetlands		Shale	
Hardpan		Coal Fines	
Sandstone			

Silt

Heavy	
Moderate	
Normal	X
Free	

Embeddedness

Extensive	
Moderate	X
Normal	
None	

STREAM NAME:______Virgil Ditch _______ REACH ID:_____#3_______ DATE:__9/7/13_____ Page 9 of 13

Velocity Measurements

Using flow meter in center of stream, half way from bottom.

VELOCITY (FT/S)	TRAVEL TIME (sec/ft)	GPS#
0	N/A	
50		
100		
150		
200		

STREAM NAME:_____Virgil Ditch _______ REACH ID:_____#3_______ DATE:__9/7/13_____

Instream Cover:

Check all that apply

Undercut Banks		Pools > 70 cm		Aquatic Macrophytes	
Overhanging Vegetation		Rootwads	X	Oxbows, Backwaters	
Shallows (in slow water)	X	Boulders		Logs or woody Debris	X
Rootmats					

Amount

Extensive > 75%	
Moderate 25 - 75%	X
Sparse 5 - < 25%	
Nearly Absent <5%	

Aquatic/Instream Vegetation:

Vegetation (%): Rooted Emergent:_15%__ Rooted Submergent:_10%_ Rooted Floating:____

Free Floating:____ Floating Algae:__30%_ Attached Algae:____ No Vegetation:__55%__

STREAM NAME:_____Virgil Ditch ______ REACH ID:_____#3______ DATE:__9/7/13_____

Floodplain Vegetation and Land use (within 100 ft of stream)

***Dominant Land Use (%)*:**

Left: Agricultural:__100%__ Open Space:______ Recreational: ______
Commercial/Industrial:______ Residential:______ Other:______

Right: Agricultural:__100%___ Open Space:______ Recreational:______
Commercial/Industrial:_____ Residential:______ Other:______

***Land Cover (%)*:**
Left: Trees: ______ Lawn:______ Wetlands:______ Crops:__80%___ Shrubs:______
Herbaceous: __20%____ Impervious:______ Water:______ Other: ______

Right: Trees: ______ Lawn:______ Wetlands:______ Crops:__80%____ Shrubs:______
Herbaceous: ___20%___ Impervious:______ Water:______ Other: ______

Width of Vegetated Buffer:

Wide	**Moderate**	**Narrow**	**Very Narrow**	**None**
Width of riparian zone >150 feet; human activities (parking lots, roadbeds, lawns, crops) have not impacted zone	Width of riparian zone 30--145 feet; human activities impacted zone minimally	Width of riparian zone is16-30 3ft	Width of riparian zone <16ft; human activities have impacted zone a great deal	A riparian zone is not present.
Right Bank:		X		
Left Bank:		X		

Bank Vegetation (within 10 ft of stream): ***Predominant Vegetation:***

Left Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:___ Shrub:_X__ Crop:___
Herbaceous: _X__ None:___ Other:_____

Right Bank: Unmowed Grass:___ Lawn:___ Wetland:___ Trees:___ Shrub:_X__ Crop:___
Herbaceous: __X_ None:___ Other:_____

Predominant Tree/Shrub Species on Banks (Check All Present)

Willows____ Box Elder____ Honeysuckle___ Buckthorn___ Hardwoods___ Other___

STREAM NAME:______Virgil Ditch ______ REACH ID:_____#3_______ DATE:__9/7/13_____ Page 12 of 13

DISCHARGE POINTS (Pipes, ditches, swales, tributaries; note numbers, sizes and locations of discharges with diameters of 4 inches or more.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES: (ex: amount of flow, odors, sheens, etc.)
					None

STREAM NAME:______Virgil Ditch _______ REACH ID:_____#3_______ DATE:__9/7/13_____

HYDRAULIC STRUCTURES: These include low head dams, weirs, bridges, levees, and culverts. Dimensions as well as construction materials should be measured and recorded. (Note sizes & locations in channel or adjacent floodplain. Also note condition, drop or change in elevation, blockages and other characteristics.)

TYPE & MATERIAL	DIMENSIONS (inches)	GPS #	PHOTO #	L/R or Center of Channel	NOTES:
					None

*68/120

Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 57 good

Stream & Location: Virgil Ditch #3 *RM:* ___ *Date:* __/__/06

Scorers Full Name & Affiliation: ____

River Code: __-__-__ *STORET #:* ____ *Lat / Long:* (NAD 83 - decimal °) ____ / ____ Office verified location ☐

1] SUBSTRATE
Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]	___	___	☐☐ HARDPAN [4]	___	___
☐☐ BOULDER [9]	___	___	☐☐ DETRITUS [3]	___	___
☐☐ COBBLE [8]	___	___	☐☐ MUCK [2]	___	___
☐☐ GRAVEL [7]	___	___	☐☐ SILT [2]	___	___
☐☐ SAND [6]	___	___	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN
☐ LIMESTONE [1]
☐ TILLS [1]
☐ WETLANDS [0]
☐ HARDPAN [0]
☐ SANDSTONE [0]
☐ RIPRAP [0]
☐ LACUSTURINE [0]
☐ SHALE [-1]
☐ COAL FINES [-2]

QUALITY
SILT
☐ HEAVY [-2]
☐ MODERATE [-1]
☐ NORMAL [0]
☐ FREE [1]
EMBEDDEDNESS
☐ EXTENSIVE [-2]
☐ MODERATE [-1]
☐ NORMAL [0]
☐ NONE [1]

Substrate Maximum 20: 20

2] INSTREAM COVER
Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

___ UNDERCUT BANKS [1]
___ OVERHANGING VEGETATION [1]
___ SHALLOWS (IN SLOW WATER) [1]
___ ROOTMATS [1]
___ POOLS > 70cm [2]
___ ROOTWADS [1]
___ BOULDERS [1]
___ OXBOWS, BACKWATERS [1]
___ AQUATIC MACROPHYTES [1]
___ LOGS OR WOODY DEBRIS [1]

AMOUNT
Check ONE (Or 2 & average)
☐ EXTENSIVE >75% [11]
☐ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 10

3] CHANNEL MORPHOLOGY
Check ONE in each category (Or 2 & average)

SINUOSITY
☐ HIGH [4]
☐ MODERATE [3]
☐ LOW [2]
☐ NONE [1]

DEVELOPMENT
☐ EXCELLENT [7]
☐ GOOD [5]
☐ FAIR [3]
☐ POOR [1]

CHANNELIZATION
☐ NONE [6]
☐ RECOVERED [4]
☐ RECOVERING [3]
☐ RECENT OR NO RECOVERY [1]

STABILITY
☐ HIGH [3]
☐ MODERATE [2]
☐ LOW [1]

Comments

Channel Maximum 20: 14

4] BANK EROSION AND RIPARIAN ZONE
Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)
☐☐ NONE / LITTLE [3]
☐☐ MODERATE [2]
☐☐ HEAVY / SEVERE [1]

RIPARIAN WIDTH (L R)
☐☐ WIDE > 50m [4]
☐☐ MODERATE 10-50m [3]
☐☐ NARROW 5-10m [2]
☐☐ VERY NARROW < 5m [1]
☐☐ NONE [0]

FLOOD PLAIN QUALITY (L R)
☐☐ FOREST, SWAMP [3]
☐☐ SHRUB OR OLD FIELD [2]
☐☐ RESIDENTIAL, PARK, NEW FIELD [1]
☐☐ FENCED PASTURE [1]
☐☐ OPEN PASTURE, ROWCROP [0]
☐☐ CONSERVATION TILLAGE [1]
☐☐ URBAN OR INDUSTRIAL [0]
☐☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 7

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH
Check ONE (ONLY!)
☐ > 1m [6]
☐ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH
Check ONE (Or 2 & average)
☐ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY
Check ALL that apply
☐ TORRENTIAL [-1]
☐ VERY FAST [1]
☐ FAST [1]
☐ MODERATE [1]
☐ SLOW [1]
☐ INTERSTITIAL [-1]
☐ INTERMITTENT [-2]
☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: -1

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average).

☐ NO RIFFLE [metric=0]

RIFFLE DEPTH
☐ BEST AREAS > 10cm [2]
☐ BEST AREAS 5-10cm [1]
☐ BEST AREAS < 5cm [metric=0]

RUN DEPTH
☐ MAXIMUM > 50cm [2]
☐ MAXIMUM < 50cm [1]

RIFFLE / RUN SUBSTRATE
☐ STABLE (e.g., Cobble, Boulder) [2]
☐ MOD. STABLE (e.g., Large Gravel) [1]
☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]

RIFFLE / RUN EMBEDDEDNESS
☐ NONE [2]
☐ LOW [1]
☐ MODERATE [0]
☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT (ft/mi)
DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: ____ %GLIDE: ____
%RUN: ____ %RIFFLE: ____

Gradient Maximum 10: 2

Additional criteria

Aquatic Biota:

Macroinvertebrates **[2]**

-Excellent (4)
- Good (2)
- Fair (1)
- Poor/None (0)

Fish/Amphibians **[2]**
- Present (2)
- None (0)

Big Clams **[1]**
-Excellent (4)
-Good (2)
-Fair (1)
-Poor/None (0)

Water Quality

Aqueous Chemistry **[5]**

-Excellent (7)
-Good (5)
-Fair (1)
-Poor (0)

Aesthetics **[2]**

-Excellent (3)
-Good (2)
-Fair (1)
-Poor (0)